

9A

PRINCIPLES OF Natural Philosophy

MADE EASIE:

From a NEW

HYPOTHESIS

Not, hitherto, Advanced.



L O N D O N:

Printed for R. Smith, at the Angel and
Bible without Temple-bar. 1706.

PRINCIPLES

TO

A SYSTEM OF PHYSIOLOGY

MADE EASY:



62d

AN
APOLOGY
For the Ensuing
PREFACE.

Having, in some of my Thoughts, come too near Mr. Hobbs's notions, lest I should meet with his fate, and be censur'd as one who endeavours to prosecute the same end. I judg'd my self oblig'd to satisfy the world of the honesty of my Intentions: and to shew (as well as may be expected from one who does not profess Divinity, and whose time has been, too little, taken up in reading, and considering, the Scriptures) that I have endeavour'd to chuse, from all Philosophers, only such Principles as may serve to make men have a natural knowledge of themselves: and reconcile this knowledge to Divine Revelation: so that, even from natural Philosophy, they may receive such instructions as may influence their actions, and incline them to virtue.

But for me (my time having been, wholly, employ'd

An Apology for

employ'd in the studies of natural Philosophy) to undertake such a task without exposing my self to Divines, (whose studies I must, of necessity, have encroach'd upon) would have been impossible, and to have omitted adding something, of that nature, might prove dangerous; and expose my honest meaning not only to the mistakes of virtuous, and zealous, persons, but to men of vicious, and deprav'd inclinations: who might make an ill use of such instruments, as I have endeavour'd to frame, for a contrary use.

For these considerations, I suffer'd some notes which, formerly, had been the effect of a florid, juvenile, fancy, for the private entertainment of a person of quality, to be transcribed, and join'd to papers, to which they never were design'd to belong.

The conjectures, whatever they are, I presume may escape censure, since I profess them not design'd to bias any ones judgment; if they carry but a shew of morality with them, I have my end.

Nor do I think it necessary to oblige my self to rest satisfied, of the truth of every conjecture, delivered in the following Preface; since the whole was but a sudden thought; the effect of but a very few leisure hours: neither have I thought it worth my while to alter any of the thoughts; having nothing but barren conjectures,

the Ensuing Preface.

conjectures, to substitute in their places ;
should I cancel any of them.

As for the book, or the natural account I
have deliver'd of bodies ; it being the effect
of some years study, and experiments, I may,
with modesty enough, think myself capable of
delivering something on that Subject, to the
purpose. But really, so far am I from having
a fondness for any offspring of my own brain,
that I shall always reckon any of its products
spurious ; unless made legitimate by the ge-
neral vogue, of learned, and ingenious, men,
tis this jealousy of my own performances in-
deed, that makes me, with so much haste,
suffer this little tract to be published : for had
I rested, altogether satisfied, of the truth of
every particular, I have delivered, I had
taken more time to have methodiz'd my argu-
ments, and set the whole off with Sculptures,
to a much better advantage : resolving to sus-
pend the judgment of my own thoughts, till
I heard what opinion others would have of
them ; delay would have proved too great a
mortification to that tender part of me (for,
I must own, I am very inclinable to embrace,
with pleasure, any thoughts of mine that are
brought forth with reason) which always en-
deavours to do justice to any reasonable issue ;
and free them, as soon as possible, from the
doom I, quickly, pass, upon all unreasonable
notions

An Apology for, &c.

notions (tho' of my own begetting) when I know them to be so.

In fine, by this means, I shall, soon, find out in what manner I may, best, dispose of my time, for the future, to make my studies useful to the world, or easy to my self: for I can never be easy in my mind, whilst I fancy I may have some thoughts that might prove serviceable to the publick: but if my capacity be not large enough to answer my designs, I shall, by this means, find out, and with as much contentedness, sit down, and please my self, with my own thoughts, as ever I took pen in hand to please the world.

THE

THE
P R E F A C E :
B E I N G
An Enquiry after a true
Criterion, or Rule, to
guide our Reason,
and Judgment of
things, by.

THE perfection of Angels, and blessed Spirits, consists in their having no dissentious opinions one from the other : but all have the same apprehensions of things, compar'd

A 2 with

with the innate knowledge they have of the Deity ; and their increase of knowledge consists in making the conception of every new object, they perceive, square with the true conception each frames of the Deity ; which makes them also to agree among themselves : according to the old Axiom in Philosophy ; those things that agree to the same third principle agree among themselves. To express this their conception of things there needs no words, or such mean comparisons, as Mortals are forc'd to make use of, to discover their Souls (or apprehensions of things) to one another : because every

The Preface.

v

every part, of the Soul is an Eye and Ear which discovers whether any object in the Soul (that associates with it) differs either in colour, or sound, to the conception it has fram'd of the Universe: as a skilful Ear in Musick must know whether such an Instrument is out of tune, and unfit to joyn in consort with his; which, he has some certainty, is tun'd to the rest of the Instruments of his consort. Everything therefore that a happy Spirit comprehends, he compares, first, with the apprehensions, and knowledge, he has of the Deity: and, secondly, with its acquir'd knowledge that it has, already, ob-

bnoe

A 3

tain'd

tain'd of things ; which can be only, thus far explain'd by Mortals, wiz. that it tends to make them know the Happiness, and Enjoyment, they have in the society of each other ; and square all their apprehensions, and comparisons of things with that rule, which makes them thus agree in one voice, or harmonious concord. By this means they all think alike : nor does the greater knowledge which some Spirits obtain, above others, contradict this : for it only happens from the opportunity (which may be by the greater diligence, or greater proneness of the Soul that some happy Spirits have be-

yond others to action) comparing more things, and making them square, with the apprehensions they have of the Deity; and yet, at the same time, agree, in every thought, as well with those that are co-ordinate with them in knowledge; as with those that are inferior, and superior to them: their knowledge consisting only in a comparison of all Beings, whether Body, or Spirit: with the principles, and light, the Deity has afforded them, of its own nature; and the comparison they have, already, made of things which agreed in concord with the voice, or sound, of the society they have had

with intelligent, or happy Be-
ings.

*Before the fall of Angels there
was, in Heaven, this perfect har-
mony ; that every opinion,
conception, or notion, of any
new object, squard with the
receiv'd opinions of all the
heavenly Host ; and tended to
the promotion of the heavenly
Society ; by giving them a, more
clear, Idea how impossible it
would be to expect, and enjoy,
that perfect tranquillity, and hap-
piness, without Unanimity,
and Concord : and, the more
knowledge the Spirit acquir'd ;
with the greater warmnes, and
eagernes, did it embrace this
Society*

Society ; as having the greater, and more perfect, Sense of it : until Lucifer, an envious Angel perceiving, that (tho' he still increased in knowledge, and truth, yet) there would always be a Being or Beings more knowing than he, for (tho' he was an Arch-angel, he need not be suppos'd to have been the most knowing of them) he suppos'd that this only, accidentally, happen'd from his wrong conception of things : and that all happiness, or knowledge, did not consist in the Society with the blessed Spirits : but that if he should, once, break off Society with them ; he might be, then, the most knowing Being

x The Preface.

ing himself; for that, whilst he continued in the Society, he was in, he must, still, acknowledge a Supream; attributing his Subjection to be only an accidental consequence, in the disposal of things at first, and that all Spirits had, lazily, acquiesced to this Supremacy, of another over them. He therefore suppos'd, by some alteration, in the form of his conceptions, he might, at last, bring himself to the pass to be equal with the Supremest Being: thinking no other difference betwixt the most High, and himself, than his false conception, that he had received all this while, of things; in suffering

The Preface. xi

ing himself to have a bounded opinion, of his own Knowledge ; and yet conceive, or believe, a Being, that he must suppose to have a boundless knowledge ; at this apprehension, or voice, of things : (for the apprehensions of the Soul, free from the Body, may be represented to our understandings ; as a sound of a great many instruments, playing consort to one another ; all which the Soul receives, and apprehends, at once ; as the Ear does Musick.) There was a discord heard in the Heavenly Choir ; from which all, rightly tun'd, and well dispos'd, Spirits, fled : as being

a sound destructive to their Harmonious Society. Some there were, who thought that sound suited best with the imperfection of their knowledge ; and tun'd their voices to it ; losing the right rule, or square, by which they us'd to form their conceptions. Each thought himself more knowing than other, and would not acknowledge Lucifer to be superior ; who, really, had acquir'd more knowledge than any of them. By this means Lucifer still continues the craftiest of them all ; as having had more knowledge before the fall : and, by his Craft, not their obedience to him, keeps them in Subjection ; and

and gains himself the Dominion over them : but this knowledge never increased ; but, on the contrary-wise, proportionably, decreased : in each, every one (suitable to the principle Lucifer had first form'd) thinking it a wrong conception of things, to allow a superior, or a more knowing Being : this destroy'd Society ; and this, only, is their Damnation, viz. that they, each, strive, with utmost power, to degrade, and make unhappy each other.

It griev'd the Heavenly Society, thus, to lose so great a number of their Consorts ; therefore to make up their number

ber, and, as it were, to provide against any such Rebellion, by suffering Beings to be created out of the meanest original (that, knowing this, they might be affected with a perfect Humility; and yet that the Being might have a Free-will, and Power, to rise to the perfection of the highest Angels) the Divine Spirit entred into matter; and so purified it, as to give it a perfect knowledge, and Idea, of its Essence.

By this innate principle, or knowledge, of the essence of God, the first man Adam was capable of a true, and perfect, Knowledge of all created Be-
ings,

ings ; only by comparing them with the inspired Idea he had received of the Deity : but this Idea, was shadow'd or clouded, by Adam's material Organs, so that there was something in the essence of the Divine nature which he could not, perfectly see : this defect was to be worn off, by the further acquain'd, knowledge that Adam was to gain ; therefore what Adam did not apprehend of the Divine Nature, by immediate inspiration, was told him by a comparison of something that he could conceive : as also if he made a wrong apprehension, and Judgment of things, the consequence that

that would follow was Death, and a farther separation from the knowledge, and society, of happy Spirits: which Society, tho Adam did not then, absolutely, enjoy, because he had not so full a knowledge of the Deity, as the Angels; yet, had he acted according to what was told him of the Deity, (his want of full knowledge being supply'd by comparisons) he had, at last, brought his reason to comprehend the full, and true, nature of the Deity; and the reason of the Comparison, call'd a command: because he, having no knowledge of it, was necessitated to make it an act of faith and, consequently,

consequently, of obedience: all commands having a relation to comparison, and human understanding, is nothing else but a comparing of things more obscure, or unknown; by things that are more known; whilst Adam squar'd his actions to the inspir'd Idea he had of the Deity join'd with the relation (or the comparing of those things he comprehended with those he did not) he received, from the Deity, concerning its Essence, and will, and the nature of Happiness, and Misery, he was happy; and in a road to immortalize his body: and make it fit for the Society of Angels.

a

But

xviii The Preface.

But the Devil (whose envy led him to the destruction of all happy beings) upbraided him, or, at least, the effeminate part of him, with want of knowledge; and his simple obedience to he did not know what, rais'd his curiosity to quit his rule or guidance by the relation or comparison he had received of the Deity; and, consequently forsaking the true square, or Norma of his conceptions; all his thoughts being drawn then from irregular, and crooked, appetites, and Desires, must, certainly, be erroneous; for if the rule be crooked, the lines, drawn by it, must be crooked also:

also : 'tis plain man (left thus without any guide, or true notion of things) must, according to the irregular conception he receives of one thing, form the conception of the next thing he sees irregular to agree with the former conception he had fram'd.

To explain this will require a small reflection on human Understanding. Adam having once introduc'd a false notion of the Deity, the consequence must be, that the next thing he sees (comparing it to the mistaken notion he has of the Deity) he will, likewise, have a wrong notion of it ; and the next thing that offers to his Sen-

ses, after that, he will form his judgment of it more erroneous than it was of the former : that being not only squar'd to the wrong principle he has receiv'd of the Deity ; but also to the erroneous Judgment he has fram'd, to his mind, of the other misapprehended substance. For as in numbers a mistake, tho' but of an Unite is small, yet when it is multiply'd, and added, the error, at last proves very great, according to the largeness of the Summ. Had Adam gone on, long in framing conceptions of things, according to his wrong notion, of the Deity, he, doubtless, would have entangled his mind so deep in error,

error, as never to have been able to have free'd his thoughts from so intricate a Labyrinth of falsehood. But he, very soon, found the discord of his opinion; and, according to what twilight of true reason that was left him, (for the true light, or inspir'd notion, of the Deity had not, quite, mov'd below the Horizon of his understanding) compares his actions, or the judgment, he had form'd (and was like to form) of things, and found it not to agree: he therefore, was resolv'd to make no more judgment of things, according to this principle: but with fear, and shame, endeavour'd, again, to

attain to that knowledge, he had lost : and, tho' he, so lately had dissented from the Knowledge of it, yet when some shadowed resemblance, of the Divine Spirit offer'd it self to his fancy (so bad the mistaken notion, he suffer'd to enter his Soul, darkned, and chang'd, the glass by which the vision of things were truly represented to his reason) that he, scarcely, knew the truth ; but is afraid, and hides from, it ; and yet is more afraid of falsehood : since it was impossible to purifie his Soul, which had suffer'd error, and mistaken notions, to mix, and incorporate with it, (as when one pure and simple

simple liquid is tinged, and corrupted, by the admission of another, the separation is not easy) immediately, from error ; the former notion he had of the Divine Essence, together with the privative comparison, to make up the defect of his conceptions (viz. that God was not to be apprehended by such, and such, resemblances, as were forbidden him to make of the Divine nature,) recollecting as much of this lost notion as was possible for him in that degenerate state ; he forms, first, these thoughts of himself, viz. that his mind had been free from error ; but now falsehood

ting'd the whole frame of his Soul :
and that, for a long time, he must
not expect to make a true, and
right, conception of any thing.
Besides he found, by his mistakes
of things, that that part of him
which was material, and was to
be improv'd (and receive ad-
dition from matter, according
to his own will) must, now, be
liable to all Accidents which
his wrong conception would, in-
evitably, bring upon him : for,
of necessity, when he began to
be ignorant of the nature of any
body, he could not tell what ope-
ration that body would have
when join'd with his ; or the dis-
position one body has to de-

stroy, or oppose, another. This he, plainly, foreseeing, knew that the accidents he was liable to, and would, by his wrong Judgment of things, unavoidably, fall upon him ; would, at last, prove the separation, or dissolution, of the tye betwixt his body, and Soul ; and that his Soul, after its freedom from matter, might (by the dark notion he then conceiv'd of the Deity, if it consented no farther to make a wrong Judgment of things, but humbly own'dt he error that had insinuated it self into his substance, and compared all things according to the privative notion that he had a-fresh conceived of the Deity,

viz.

viz. that he was not of a bodily substance) at last, come to the same perfection of Knowledge of the Divine essence, that it had lost; and the body, by suffering a dissolution with the rest of matter, might bring it self to such a state that the Soul, inspir'd with a true knowledge of the nature of things, might only pick out, and chose, such parts of it as are fit, and will unite, and square, with the notions the Soul has receiv'd of the Deity; and those other things that have offer'd themselves to its ratiocination: which have all agreed to the received opinion of the Deity. Since we have there-

therefore thus consider'd Adam as he repents, and sticks to his obedience, viz. the privative knowledge he has of the Deity: for the knowlege of the Divine essence, which Adam had before his error, was not perfect; only enough to give him sufficient understanding of all matter: that, thereby, he might not joyn absurdities together, which might, at last, destroy his own body; which was matter also. All the rest of the Divine will was resembled to him by a privative example, viz. (that what he did not understand, of the Divine essence, was not to be compar'd to any thing he had, already, a resemblance of. It

xxviii The Preface.

It may not be amiss, a little, to think on his State had he not repented ; but cast off all thoughts or notions of the Deity. To represent him in this state, we must suppose a man in perfect strength ; having a reasonable Soul, and all the Organs of the body (by which the Soul operates) in perfect Vigo[u]r : (to obviate what might be objected of Children's not having a right reason of things, because of the weakness of their bodily Organs :) this man must be brought, in this state, into the world ; without any thought or notion of the De-

ity ; or of any other thing whatsoever. The first thought that any may suppose such a person will have (for having a rational Soul, he must have thought) may, justly, be suppos'd to be of himself. This thought can extend it self no farther, than that he is something which has desire and appetite to matter : for having no notion of the Deity, or of his own state ; what he is, or how he came there, he must be, wholly, ignorant of ; as also that he is mortal, and that he is a creature capable of human society : and that there are, have been, or shall be, other intelligent Beings

gbul

xxx The Preface:

Beings besides himself: all this,
he being ignorant of, he must, of
necessity frame a wrong Judgment
to himself.

The next thing that he meets
with, or thinks on, he can have
no other way to represent it to
his fancy; than by compa-
ring it to the thought he has
fram'd of himself: which be-
ing false (as, suppose, never see-
ing any person, he might think
himself immortal) the notion
of that cannot be true, or
st freight; because 'tis made to
agree with the irregular
thoughts he has conceiv'd of
himself.

The next thing he makes a
Judg-

Judgment of, must be more erroneous than the former : because he does not only make it agree with the error he receives, in the opinion of himself ; but also with the error he has conceiv'd in the wrong Judgment of the other body, compar'd to himself. And thus would his error increase, and multiply, until it bring him to conceive the vilest absurdity ; and, consequently, order himself, and his actions, in the greatest disorder, and confusion.

If we suppose another man in the same condition with the former ; no one can be, easily, brought to believe he shall, exactly

actly, have the same thoughts with the former : because both frame their thoughts, and notions, of things , by wrong, and crooked, principles. These two, not agreeing in their thoughts of things , will neither agree in the disposition of them ; and, consequently, quarrel, and destroy, each other. This is Sin, the nature of which, if rightly consider'd, will appear to be nothing but the ignorance of bodies, and their effects ; when joyn'd together, with the disposition one body has to destroy and ruin, another. Any other thought of sin wou'd be blasphemous ; for instance Blasphemy

phemy (speaking contemptibly, or framing, in the thought, mean comparisons of the Deity) is, no otherwise, a Sin, than that it causes, in the Creature, a less true knowledge of the Deity, than it had before : either by thinking on the Divine essence, by some mean comparison ; or making the thoughts we have of it (tho' compar'd to no bodily substance) too familiar, and consonant, to the slightest, and idlest, apprehensions, we have of things.

For to think of God (as we
would of a revengeful man) that
because man speaks revilingly, or
scornfully of him, he will punish

xxxiv The Preface.

him for no other reason than to vindicate his honour ; will insinuate, into the apprehensions, so fram'd of the Deity, an equal absurdity, to what was conceiv'd of him under the meanest comparison : by thinking of his essence under the notion of a revengeful Spirit : and tho' by the writing of holy men (who, by their endeavouring to surmount the ignorance, crept into human nature, by some peculiar mystery belonging to the Divine Essence, attained to some glances, or shadow, of the perfect truth) the Deity is represented with passions as of anger, &c. this is occasioned by the great ignorance

The Preface. XXXV

ignorance of man : for all the motives of the passion of (Love, Concord, Harmony, &c. being resemblances that represent the Divine nature with more similitude than any other comparison) would never move an ungrateful mind, or work upon it, to have a better conception of things, with so much Sympathy of nature, as his cowardly mind is forc'd, and aw'd, into complyance with the truth, by the silly passion Fear.

The nature of sin will be better understood by reflecting on its Original : therefore, again, Adam is to be brought on the Stage in Paradise ; here he has a perfect

sub z in affect

xxxvi The Preface.

fect knowledge of all things he sees: and knows what effect any body, he sees, will have, if it be joyn'd to his: all this he knows by the knowledge he has of the Divine nature, and of himself: consequently he knew the nature of poisons, or poisonous fruits: (for to suppose there were no such thing would be absurd; and to suppose Adam knew not the effect, or operation, they would have in his stomach, if they were swallow'd by him, would be absurd also: for, by that means, his curiosity might have led him to have tasted, and have poison'd himself. Adam knew the nature of every body on Earth (except of the fruit of one Tree) and therefore

The Preface. xxxvii

therefore, in that, could not err ; for
bad his curiosity led him to eat
of any poisonous body, that
he knew so, to try the effect,
yet, immediately, upon the pain,
and the Danger, he found him-
self in, knowing from whence his
disorder proceeded, and what
would remedy it, (for knowing the
poison and all things besides, he
certainly must know an Antidote)
would have had recourse to a
Medicine, by the knowledge
he had of things, upon any such
accident.

This knowledge is, properly
enough, resembled by the tree
of life, made mention of in the hi-
story of Adam : but the nature
of the fruit of one tree he did not

xxxviii The Preface.

know ; neither (should he taste of it) could his knowledge direct him to an antidote. The nature of the poison of this tree was only, like that of other poisons, destructive to his body ; and had no immediate operation upon the soul. But I shall, hereafter, endeavour to prove that the disorder, or irregularities, of the Body, is what causes disorder, and irregularities in the soul. Adam (reflecting upon himself, and the thoughts he framed of the Divine nature) finds, according to the principle he guided his reason by, that this tree, should he taste it, would bring death, and destruction

would

s d

ction, to his body. But this only, of all the things in the creation, was a Mystery unto him : tho' comparing it again to the right, and Divine, rules of reason, (which consists only in a knowledge of the Deity, and a conformity of thoughts with those of their associates : for Adam, by this time, had got a companion, who, in every thing, thought as he did ; in which consists the blessing of Society) he finds it will cause death ; and Eve thinks so with him : and whilst they, thus, continued in the truth they were both happy. But Eve, who did not, so perfectly, know the Divine na-

ture as Adam, was tempted by Satan, to taste. Adam, perhaps, had he seen Satan in the form of a serpent, had known him to be an Evil Spirit, by the innate knowledge he had of things: but Eve was later come into the world; and, what she wanted of Adam's knowledge, she was to be instructed in by him; therefore was, easier, tempted: and, coming to Adam, he might, immediately, see a change, or an unharmonious sound, in their thoughts: therefore he thus reasons with himself; According to one principle by which I judge of things, (viz. the Divine will,) this

partner, or associate, must die
and I shall live without her : but,
according to the other principle
that I reason by, (viz. making all
conceptions of things to agree
with the conceptions of my As-
sociate) she shall not die : and
some other Being has told her so :
therefore, perhaps, I am in an
error, and have a wrong noti-
on of the Deity. I cannot bear
the wracking thoughts of par-
ting with the joy, I receiv'd, in
thinking of all things in con-
fort with my Dear companion :
therefore, in this, I must think
with her, I shall not die, I'll eat
and try.

Thus did they, both, poison
their

their bodies ; and make the organs, or material instruments, by which matter was to be refin'd, and joyn'd to the rational Soul, liable to change, and destruction : and, consequently, unfit to perform that function. Could Adam but have found an antidote to this poison, that might have preserv'd his body from death (for such a one it may be suppos'd there might have been in nature) he had, for ever, liv'd; but most miserably wretched : for tho' he, always, liv'd, free from Death; yet, always, subject to disease : to prevent this, his understanding was distracted by a wrong, and wavering

wavering notion, of things :
(represented by the flaming
sword, placed to guard the tree
of life) these distractions, and
waverings in his thoughts, pro-
ceed from his loss of the Divine
will : and from the confusion,
distraction, and discord, be-
tween him, and, his wife, Eve ;
these two things (viz. confor-
mation of thoughts to the Di-
vine will, and to make them a-
gree with the thoughts of his
Associate) being the only rule,
or criterion, he had to judge, of
things, by : finding a distracti-
on in both these, (for it may be
suppos'd that he had lost his no-
tion of the Deity;) and also the

xliv The Preface.

the unconformable thoughts they had, and different apprehensions of things, seem to be insinuated in their being ashamed of one another; and hiding their nakedness from one another: which may be construed of their minds as well as their bodies. This discord (had it been between any others, in that state of sin, when the poison, newly taken, was in the height of its operation) it had, very likely, carried them to immediate destruction of each other. But Adam, squaring his conceptions according to one of the principles of Virtue, laid down, viz. the love and desire he had

to

to conform his thoughts with the thoughts of Eye (who was the only intelligent Being he knew; since the loss of his Union with the Deity) found that, according to the principle each other form'd to themselves, they could never agree in sentiments. Adam persuaded Eve (who out of love to Adam, or the one, and only, principle of right reasoning, or comparing of things she had not dissent'd from) hearkens to his reasonings: he can propose nothing to her, but that she may consent, with him, to acknowledge themselves in error, and ignorance; and to look back on the lost notions of the Deity

xlvi The Preface.

Deity (as well as their odi-
sturb'd, sickly, and poison'd,
Organs would permit) to find if
there might be any relief, or re-
drefs, from this their calamity;
which she, consenting to this Har-
mony in their minds, for a
glimpse, or moment, as it
were, asswag'd the fervour of
their poison'd bodies; and
they, both, beheld the nature
of the Divine Essence. At first
it startled them; they were a-
fraid, and hid themselves: but
it, seizing on their reasons,
shewed them their condition that
they had both poison'd them-
selves: and, by that poison, had
so vitiated the taste of their rea-
son

reason, by which they were to give Judgment of things, that they must die however; if they did not consent to give any further erroneous Judgment of things: but stuck to the principle that was left, viz. the love of one another, and an endeavour to conform both their thoughts with what dark knowledge they might keep of the Deity. There might be found a way to deliver their Souls from the poison that had tainted their bodies, by suffering the body to undergo a dissolution: and, if the Soul adher'd, firmly, to its two principles, of right reasoning, it might choose, to it, those parts

xlviii The Preface.

parts of the body, which have been fitted, in this life, by the operations of right reasoning : leaving behind it the rest ; to which adhere the particles of poison, that caus'd ignorance and error.

To maintain this Hypothesis it will be necessary to suppose, (which to me does not seem absurd, viz.) that the Soul shall, at the resurrection, gather together all the parts, as well those that remain, as parts of its Substance when it died ; as those that were, daily, sent off by insensible perspiration : so that those parts which have been sent off, or spent, by the labours of Divine

vine reasoning, suited to the two principles, viz. the right notion of the Deity, and love to our neighbour, will be the only particles, or parts, that a Soul, endued with the faculty of right reasoning, will chuse: but a Soul who has spent all its life in some, very gross, errors, or wrong conformity of his actions, to the two, aforesaid, principles, it, indeed, shall have all its body represented to it to choose what of it it pleases; but for want of right knowledge of the Divine essence and a mind suitable to conform to heavenly Society, it cannot separate the poison from its

1 The Preface.

body ; and, consequently, must take its whole body up, mixt as it is with the poison : for the poisonous parts are the only parts that have not been affected with an intelligent Spirit : and, consequently, if the Soul cannot get rid of them, it can get rid of no other part : for those parts that have been affected with an intelligent Spirit, will have, what is call'd, a Sympathy to the Spirit, by which they were affected, or bear some part of the memory, or power of reasoning, with the Spirit, by which they were affected : which was the first design of the Creator, in confining his Divine Spirit

The Preface. ii

rit in matter ; that matter might be affected and purified by it ; but the particles of poison, that have corrupted nature, are such as are uncapable of being affected by the intelligent Spirit ; and, consequently, can't rise of themselves : only as they have incorporated, and are carried, by other particles of matter, which have been affected by this intelligent Spirit.

To recapitulate, the whole design of this preface is to find out, and lay down, some rule, or foundation, or, self-evident, principle, to compare all things in the Universe, that offer themselves to our understanding ;

eltrump noo and 2

Iii The Preface.

and give names, unto them (as Adam, at first, did to things in Paradise:) which is to form conceptions of things (names being only the manner by which those conceptions are delivered to one another) if there were any method to find out whether the thoughts of another, were agreeable to his : as, in Paradise, they were known by the tuneableness, of them, or sound they gave at the sight of things ; and this sound judg'd according to the rules of harmony, there would be no need of expression or speech : but where human nature is so poison'd that scarce two persons think alike, and, consequently,

consequently, not knowing, or ever hearing, the harmonious sound of concord, cannot judge whether their Sentiments of things are conformable to those of another, without some sounds, or figures, that shall signifie the thing it self; the quantity, and quality, of the thing, and the motion, or action, it is in, or what it suffers by the motion of another, or other, things. These sounds, or figures, are call'd Speech; design'd only to comply with the discord in human nature (by comparing Sentiments together) and, thereby, finding out the degrees of discord. For tho' perfect concord

cannot be found out ; yet (by comparing every one's Sentiments) it may be seen whose Sentiments come nearest with the tune of another : and what Sentiments or Sounds, of things, come nearest to the uniting of the voice of all Mankind.

But because the Laws of nature, or the Laws of God (for I make no distinction, considering that the conceptions that we have of the Laws of God, are that they make us keep within the bounds of our nature) have implanted in us, or, rather, left undemolish'd, in the ruins of our nature, a spark of the Divine

The Preface. iv

vine desire, or heavenly love
tho' so little that it cannot, ex-
tend to make an harmonious
conversation betwixt above two
persons ; and very seldom betwixt
two it self : it has fram'd them
so, that two persons (tho' ne-
ver to exceed that number) may
joyn their minds ; by mixing of
their blood, and spirits : from
which the parts, of matter, that
act upon the Soul, are fram'd
so that by this mixture, and al-
lay, a sympathy in thought
may, thence, arise to give them
some Idea of Divine conver-
sation.

I have led my self into a Sub-
ject that will bear several re-
flections. c. 4 First,

First, It may, reasonably, be
suppos'd that before Adam, and
Eve's being poison'd, there was
no distinction in Sexes; because
their Love was perfect: neither
had they the least inclination to
think contrary to one another be-
cause, in the conformity of their
thoughts, their harmony, or
pleasure, consisted in the embrac-
ing of each others thoughts;
not in the more gross embraces
of the body: nor will this no-
tion destroy the propagating
faculty, suppos'd to be implant-
ed in them, in the state of in-
nocence. We may, very well,
reason from the knowledge they
had (or, at least, mould have ac-
quir'd

quir'd, had they continued to reason according to their two principles, the knowledge of the Deity, and of themselves) of matter in general ; and how it was capable of being affected with some of the intelligent Spirit, they enjoy'd ; that they would have power to inflate matter with their own Spirit, or form, without, either receiving the matter within their form, or suffering pain by it. The thoughts of either of them, singly was not enough to accomplish this creation , (which, certainly, the Divine Spirit had, after creating them, put in their power to accomplish after the same manner)

Iviii The Preface.

ner) because this creature was to be made by a Creator : and Adam, by himself only, compar'd things according to the knowledge he had of the Deity. But when Eve was given him, as a partner to think with, he, then, compared things not only to the knowledge he had of the Deity ; but to the pleasure, and harmony, he received in an associate of his own likeness : and, by this harmony, that they both receiv'd (for harmony must, at least, consist of two sounds) they would have found out a way to have fram'd matter in such a manner, and inspire it, with some of their own Souls, tuneable to the harmony

mony they found in the joint sounds of things.

The thought will be more clear by this comparison: God made the Soul of Adam (as a skilful musician makes his first pipe in an Organ tun'd to a certain pitch for consort) tun'd to a pitch fit to join in consort with the heavenly Societies. But Adam, at first, (being not, thoroughly, skill'd in the rules of Divine harmony, or Society) had he gone about to have fram'd a sound, which must have been different, (in this lies the mystery of harmony) and yet in concord, to his own; he might, as likely, have fram'd it a discord,

cord, as a concord : because he had not a perfect knowledge of the musick, or pitch he was to tune it to. This Adam knew by what knowledge he had of the Deity : and yet, very desirous to have a companion, forsook his body with part of the matter that he found, fitly modified, unpoison'd, and rightly, prepar'd to be join'd, and united, to his body, went into the presence of the Deity ; which, while in his body, he could not, so perfectly, see (therefore, whilst Eve is said to have been creating, Adam is said to have been in a deep sleep ;) and got this matter, which he

bore with him, tun'd, and fit to make an harmonious sound to his. This was his pleasure that he had a companion who, indeed, spoke, or sounded, to him differently of things : but this difference was in concord ; and when compar'd to the Divine spirit, and himself, it agreed , and was harmonious. It was none of the smallest pleasures to them, both, to reflect how, tho' they, thus, differ'd in sound , yet that they did agree, and both were true to the rules of harmony ; and (in reflecting on the reasoun of the difference) they found this, and many differences more, might sound in concord,

and

Ixii The Preface.

and all be joind in the wisdom
of the Deity. When, therefore,
these two perceiv'd wherein har-
mony consisted, twas reasonable
to suppose they might have in-
flated matter with some of their
Spirits, and given it a voice ac-
cording to their own.

Secondly, How contrary to
the laws of nature, and true
knowledge, they act, who receive,
to their embraces, diversity of
objects : for nature, in that
reciprocal extasie of mind, not
only gives two parties, thus meet-
ing in desire, inclination, but
means also, to mix their Souls
by receiving, from each other,
those parts of Spirits which have
been

been affected with the animal heat, fire, or Soul, of each other: which Spirits, thus modified, must have some inclination towards the will of the person in whom they were prepar'd; and, consequently, affect the person that receives them, with something of the will of the person from whom they were receiv'd: since it is not only difficult, but, almost, impossible, to find three persons, whose will shall, in every respect, agree. How distracted his thoughts must be, that is, thus, affected by the differing, and, sometimes, extravagant, wills of several persons, I leave him to judge, who, at

any

any time, has been disturbed with confus'd thoughts ; and a differing, and unsettled, judgment of things !

Thirdly, How unwisely they act who suffer, to their Arms, persons of, oppositely, differing conceptions ! for these contrary Spirits, affected with contrary dispositions, must, of necessity, meeting, cause great disturbance to one another's judgments : to the destruction of love, or the union of thoughts (the consequence design'd by nature of their mutual fruition.)

Fourthly, How imprudent it is for a person of, more than ordinary, judgment, and knowledge,

ledge, to debase himself, so much, as to consent to allay, or corrupt his, purer, mind ; by receiving part of the conceptions of a foolish, mean, or injudicious Partner.

Fifthly, How extraordinarily happy those persons are who meet, embrace, and join their mind unto one only person of a suitable, and an agreeable judgment, and inclination ! This love, or joint voice, or consent, concerning every thing they see, is the only, and best, rule, that mortals can have to compare all things (whether objects of sense, or reason,) with. This is the criterion : and this

d (with

lxvi The Preface.

(with what knowledge it is allowable for mortals to have of the Deity) makes the only principle of right reasoning, and human Society.

Man's Idea, or conception of things is simple, and can be employ'd about no more than one thing at the same time : (in this the happiness of unconfid Spirits, excells mortal happiness ; that Spirits see, judge, and converse, with many objects, at the same instant, and join in love, and transport with them all) and this one thing must be represented to him by a simple, or single, object. His love therefore, I say, (properly

The Preface. lxvii

*so call'd, being that passion
which comes nearest to the Di-
vine Society, and friendship,
of Angels) cannot be extended
to two things at the same time :
for whilst he is loving, or com-
paring his apprehensions of
things to the love he has for the
one ; he cannot love, or com-
pare his apprehensions of things
to the love he has for the other :
no more than he that's reasoning
on a Subject, can give reason
and argument, on differing
Topicks, at the same instant.*

John Hsmith's Almanack for
the year of our Lord 1700.
The author has given his name to
the author of the following Preface.

A Letter to a very worthy, and learned, Divine; who objected against the publishing of the foregoing Preface.

Reverend Sir,

AS I esteem your judgment, so I can't but acknowledge your kindness, in affording it me so candidly, in relation to some papers I, lately, offer'd to your perusal:

nor do I think it a small *mark* of your *sincerity*, and *tenderness*, that you are pleas'd to caution me against the *censure* of the *world*; and point out, to me, failings that I am not able to justify.

The commendation you give the *Book*, or subject, matter it self, is enough to make me hope, that whilst I confine my *pen*, within my own *sphere* of *activity*, I may, at least, slip through the *censorious part* of the *world*: But where I am forc'd (as 'twere) to venture *ultra crepidam*, 'tis there---

You are under the most concern for me; and there indeed

indeed I should be under concern for my self, had I not this *plea* to make, that the *Preface* (the part you judge most liable to censure) was writ, when, in comparison, I was a meer *Child*, and having, then, expos'd it to the view of some *friends*, I could not, now, alter any thing in it, without taking upon me the *vindication* of it; and to have undertaken a new *task* of that *nature* (for I think a *Naturalist* absolutely oblig'd to say something of that kind) might, too far, expose my *weakness*, and the character, I have, since, gain'd, by my *improve-*

ment in other studies ; whilst, in *Theology*, I can't pretend to have made any *advance*.

I am pleas'd with your taking notice of the *precariousness*, of what is delivered in the *preface*, concerning *Propagation without distinction of Sexes*; for I find it dissonant to several *places* in *Scripture*, particularly, *Male and Female created He them.*

Gen. 9. 27.

Mattb. 19.4. *He which made them, at the beginning, made them Male and Female.* I am now far from vindicating that thought : tho' I hope, by considering what grounds I, then, built it upon, to vindicate my self from being

being thought, then, to have broach'd notions without the least dawning of reason. I am, even yet, far from being satisfied that Adam and Eve, whilst in the state of Innocence, must have been forc'd to that incommodious way of propagation that mortals are subject to; since that expression ; Gen. 3. 16. in sorrow shalt thou bring forth Children, is reckon'd a curse, and a punishment, inflicted on Eve for her disobedience.

Considering well this text, viz. Unto Adam, Gen. 3, 21. and his Wife, did the Lord God make coats of Skins, and cloathed

cloathed them : it seem'd, as indeed it does yet, not altogether so plausible an opinion to believe that those Skins were Skins of beasts, taken off, and sewed together ; as to think thereby, is meant the very Skin which Mortals, from him inherit ; and which they are born with : for to believe Adam, who had so well understood the nature of things, as to give names to all things, should be so ignorant as not to know how to make himself cloaths, is, in my opinion, too something precarious.

What seems to argue for this thought, is the curse, a lit-

le before, laid on the ground
verse 17. (cursed is the ground
for thy sake) which curse must
consequently, extend it self
to the air; since the air is
nothing but exhalations from
the earth: and where the earth
consists of barren, marshy,
or nitrous soil; the air is af-
fected thereby. If the earth
was of a purer mould before
the fall, the air must also
have been of a more æthereal
substance; if so, the organs of
man, that were created for a
more æthereal region, as Para-
dise may be suppos'd to be,
must necessarily, without some
natural tegument, be incommo-
ded,

ded , when , immediately ,
brought into a grosser *region* ;
so that , before man is abso-
lutely turn'd out of *Paradise* ,
God takes care to cover him
with such *matter* as may be
an *armour* to him against the
rough *assaults* of the *climate* he
is to be forc'd into . I could
easily perswade my self , to
be of an *opinion* that the want
of these *Skins* , wherewith *Adam*
and *Eve* were cloathed , after
their *disobedience* , were , whilst
in their *Innocence* in *Paradise* ,
none of the smallest *grounds*
of their *happiness* : for the great-
est *happiness* we enjoy on *earth*
is from our two noblest *senses*
of

of seeing and hearing ; had nature given us a greater *latitude* in this it had been liable to the *inconveniences* of the gross ambient air ; but where, as in *Paradise*, the temperature of the air was pure, and æthereal, and man in an immortal state ; the *pureness* of the medium seems to require a purer regument : and if, in *pureness*, and *subtileness*, we suppose their coverings to equalize the curious texture of the eye, or ear, or both ; the immortal state, and perfect *happiness*, they were in, before the *fall*, does not, in the least, argue against such a *supposition*.

All

All the difference I find between the thoughts I am inclinable to embrace of Adam, in *Innocence*, and what is generally receiv'd, is that I can't perswade my fancy to make so great a distinction between his state, and the state of Angels; as the generality of men do indeed, considering the great difference there is between mortality, and immortality, methinks the general opinion does not come up to the nobleness of his state: the thoughts of *Paradise* is too mean, when 'tis only compar'd to a garden, and the fruit thought on under the notion of what we see; the thoughts

thoughts of that climate, where
in the tree of life was planted,
and the Deity vouchsafed to
walk, and converse with man,
must needs be incompatible
with what these regions, where
nothing but corruption is en-
gendred, can afford.

As to the other objections,
you were pleas'd to make to
the preface (which was some
time ago writ, and join'd as
a preface to thoughts, which
are far from deserving the
Publick view) since they are
just, I judge it better to pass
them over, untaken notice of,
than, by a repeating of them to
do so much *injury to thoughts*, I
confess,

confess, I am something fond of; for, tho', in themselves, they may not be altogether so clear, yet they have prov'd guides, and inlets, to noble, and Divine, speculations: as being the first directors that put me, in the beginning of my progress, in the true way to pursue nature; plainly pointing out the gulfs, into which a great many learned men have plung'd, and, on the road, exhibiting beauties to my fancy, that I am not able to express.

It may be thought, by some, a mark of too great confidence, to rest too much asfurd of the truth of any thing; let

let such *scepticks*, waver betwixt *truth*, and *ignorance*: for for my part whilst I keep within *view* of the *Divine commands* (or the *knowledge* that is allowable for *man* to have of the *Deity*) and find a perfect, and infallible *erection* of the truth of any thing by my *Senses*: that thing, by me, shall be proclaimed *true*: nor shall all the *Sophists* in the *world* perswade me to the contrary.

But again; because I know how *hard* it is to keep before my *eyes* the perfect *truth* (which certainly the *Scriptures*, or the *word of God*, contains)

I shall ever judge of things with *caution, modesty, and Suspision*: enquiring always, what advantage any thought of any body may prove towards the better *Seeing, or understanding,* of the **Divine truth**; which always, when found, carries with it its own *evidence.*

I have so much *charity for mankind*, that could I describe the thoughts I have, whilst I consider *nature*, rightly pursued, as the chief *guide to virtue, and religion*, with the same beauty and *harmony*, they strike my *fancy*; I should attempt to express my self on this *subject*, at least believing it might prove

prove something *advantageous* to the less knowing, and *happy*, of them.

But I find a great deal of difference betwixt *thinking* and *expressing*, the *thought*: nor does the same *thought*, after I have endeavour'd to word it, strike my own *mind*, upon a review with half so pleasing a *motion* as what was caus'd by the *first*, immediate, stroak of *truth*, and *reason*, on the *fancy*: nay, sometimes I find by the expressions, the very *different*, and sometimes *latent* signification of *words* causes a quite *different motion*, even in *my self*, than what I at *first* re-

ceiv'd : how far then may I
be from thinking, by these
expressions , to incite in
a stranger, whose mind is no
ways prepar'd, or inclinable to
such a *motion* ; the same *glan-*
ces, of *reason* which have been
only, as 'twere, reflected to
my Soul by the *position*, or *tem-*
per, the mind was, at that *in-*
stant, modulated into by pre-
ceeding *thoughts*.

I dare venture to say there
has not been one *vice* that I
have not, at some time or o-
ther, in my pursuit of *nature*,
found absolutely contrary to
it; and naturally destructive of
health, and happiness. And
these

these thoughts have appear'd arm'd, with so much reason and evidence, that, whilst they have prevail'd in their *primitive vigour*, I could, as soon, perswade my self to consent to the *swallowing* of *poison* into my *stomach*, as suffer it to be insinuated, by other means, into my *nature*: which I certainly perswaded my self, would be the *consequence* of such *actions*; and these *perswasions* built upon the clearest evidence.

Considering how inseparable an *union* there is betwixt the *body*, and the *mind*, it ought not, in my opinion,

to be reckon'd so great a *Paradox* to hold, or believe, the *disorders* of the first, the real, and sole *causers* of the *indispositions*, and *disorders* of the latter; since the intellectual *mind*, or *soul*, as it was breath-ed by the *Deity*, is a *principle*, purely *spiritual* and not ca-pable of *vice*, and *error*, only as it mix'd, and clog'd with the *particles* of *matter* which are form'd, for its *use*, by the *organs* of the *body*; if the *organs* be out of *order*, the *alloy*, *vehicle*, or *mixture*, which the *soul* receives from the *body*, must be affected likewise with the *disorders*, that are com-municated

municated to the *alloy*; and that *vice* disorders the *body*, methinks is *plain*; by turning the regular *motion* of the *Soul* (which being the *principle* of *life* the least *error*, or *wandering* in it must affect the *life* or *health*) out of its *road*; the natural *tendency* of the *Soul* being towards *virtue*, or what is *Synonymous*, tending to force the *particles* of the *body*, with it, through such *pores*, and *canales*, as may make them most minute, and spiritual, to the end that it may not be clog'd with a *vehicle*, too *thick*, and *gross*; if any of these *conduits* be *stopp'd*, as in

a curious fountain, the whole device is more, or less, impair'd ; as the *canale*, or pipe, stopp'd, has greater, or less, communication with, or influence on, the whole ; and this ferment, and disorder may be caus'd, in the *spirits*, without putting the *blood* (which I account to be the *scene* of all *distempers*, as well *eonvulsive*, as *others*) into an immediate disorder, sufficient to specify a *distemper* ; because the *blood* is the prime *canale* from which the *Soul* receives its *vehicle*: and the *obstruction*, or *hindrance* of the regular *motion*, is far beneath in some small *pipe*, or *branch*,

branch, that receives its origine from the *Blood*, so that tho' all the *pipes*, or *canales*, that are below this obstructed *tube*, prove mightily disordered, yet the *stream* above, by which these are supplied, finding constant *passages*, to vent its *particles* some other way, that it has prepar'd, and brought, to be received by the proper *vessels* suffers no present, or sensible *inconveniency*; tho' by degrees, the *obstruction* may prove so great as to affect the original *stream*.

Methinks our *modern age* seems convinc'd of the *truth* of

of this ; by having, upon
the least *chagreen*, melancho-
ly, or uneasy thoughts, imme-
diate recourse to a *Physitian* ;
who , perhaps , learnedly
pronounces them disturb'd
with vapours ; I am far from
discouraging people in this
case, being satisfied, that in
all *difforders*, as well of the
mind, as *body*, the *Physitian*
ought to be consulted, but,
in some cases, I am of opini-
on, a *Divines* judgment like-
wise ought not to be reject-
ed.

I hope, Sir, what I have
said may, sufficiently, satisfy
you that it is not out of any
slight

sight to the judgment, or over
conceited opinion of my own
performances, that I leave un-
corrected, what you've censur'd;
and since a man can propose
to himself but one, or both,
these ends in publishing his
writing, viz. either, thereby,
thinking to benefit the world;
or gain applause to himself:
you may, justly, question
which of these ends I could
propose from the *Preface*:
before I conclude, therefore
I think it will be reasonable
to say something, for your
satisfaction, in that point.

I find the *ingenuity* of our
age inclines our young Gentle-

men

men very much to the *study* of natural *Philosophy*, and the *Preface*, tho' it seems to make nothing clearly out, yet it has *notions*, and *fancies*, as they are not absolutely *Heterodox*, may incite *thoughts*, in noble *Genius's* which may prove of no small *advantage* to themselves, and others. What better foundation can be *laid* to build *Natural Philosophy* upon than that of the *Gospel*? and what can prove more *powerful* to incline *ingenious*, and *polite minds* (which indeed may be a little *staggered* at the, too great, complication of *mysteries* and may well plead for some

use

use of their *reason*) to the *em-
braces of virtue, and truth*, than
such *thoughts* of themselves as
may perswade them their
health, and life, is, deeply,
concern'd in the *actions* they
were about? in short, I should
be more *ambitious* to be *instru-
mental* to so good a *work* as this;
than to be *Monarch* of the *uni-
verse*: and if it proves that I
have advanc'd nothing to-
wards it, I have this of the
poet to please my self withal,
In magnis voluisse sat est.----

Reverend Sir,

Your most Oblieged and Humble Servant,

H-----

THE
CONTENTS
OF THE
CHAPTERS.

CHAP. I.

*An Introduction, Explaining what is meant
by the term Body; and what by Spirit.*
pag. 1.

CHAP. II.

Of Body and Spirit, join'd. pag. 7.

SECT. I.

Of Water, pag. 12.

SECT. II.

Of Salt. pag. 17.

SECT. III.

Of Fire. pag. 20.

Spect.

The Contents.

S E C T. IV.

Of the Moon, and Stars. pag. 28.

Of the Sun. pag. 33.

Of Congelation, or of Solid Bodies in general. pag. 36.

S E C T. VII.

Of Quicksilver, and Fluid Gold. pag. 38.

S E C T. VIII.

Of the perviousness, and transparency of glass. The clearness of Ice, and opaceness, of gold and other solid bodies. pag. 46.

S E C T. IX.

Of the brittleness, and malleableness, of Metals; to which are premis'd some reflections on the difference, betwixt Fluidity, and Firmness. pag. 55.

S E C T. X.

Of Elasticity. pag. 70.

Seck

The Contents.

S E C T. XI.

*Of Sounds, and their propagation; with
an account of Echoes.* Pag. 75.

S E C T. XII.

Of Light, and Colours. Pag. 91.

C H A P. III.

*Of the Operation of Spirit on Body, or of Ani-
mation in general.* pag. 103.

S E C T. I.

*Of the three sorts of Chymical Spirits, viz
vinous, acid, and urinous or animal,
with the Analogy they bear to the Spirit,
Soul, or Life, of all bodies.* pag. 103.

S E C T. II.

*Of the Seminal, or Prolifick quality of bodies
inspired either with a sensitive, vegetative,
or rational, Soul.*

S E C T. III.

*The Soul of Brutes consider'd as it is the
cause of sensation.*

C H A P. I.

An INTRODUCTION

*Explaining what is meant by
the term Body; and what by
Spirit.*

BY body is understood either that which has dimension, obvious to our senses; or whose parts are so very minute, that, tho' we may be sure they are parts of matter, yet are they neither to be seen, nor felt; because their parts are finer, or, at least, as fine as those of the Air, (the Medium in which we perceive all sensible Objects;) of this kind of body, or substance. Air it self is a Species, as are also all the Effuvia, that continually

flow from all bodies ; more especially from those bodies that are animated by Soul, or Spirit ; and , of those in the most profuse manner, from the bodies of botter animals, known by the name of insensible perspiration.

Body is compos'd either of particles

I. Aqueous or incombustable

II. Oleagenous or combustible

To one , or both these heads, may be reduc'd all natural Beings of what kind soever. The particular enumeration of which belongs to the next Chapter.

Spirit, purely so call'd, there is no such (except the Deity, and all Created Beings, have an alloy of matter whose perfection consists in its refinedness from dross ; and aptness for local motion :) Spirit, or the Deity, being the Principle by which, and in which, all things move :

A
by.

by how much *swifter* therefore the motion, and by how much less *clog'd* the Spirit ; by so much the more noble, and Divine, the Being.

This doctrine may be oppos'd by a notable objection : *Viz.* That Devils, and Infernal Beings, by this rule, are more Divine than the greatest Saints upon earth, whilst in the body ; because their motion is suppos'd to be *swifter* than that of men can, possibly, be, by Natural means : To this may be answer'd, that (Divine Perfection consisting in knowledge) every body will allow Devils to partake of this in a more especial manner than Mortals, who have been, ever since Adam, more *clog'd*, and *confin'd*, in matter (than any other rational Being) to get rid, and disengage it self, of this *clog* is the whole business of men : which, when accomplish'd, must certainly be attended with more commendation, by how much more he deserves, who makes a curious

piece of Artifice, than he that destroys one, already, made. Man is, in a manner, left to be his own Creator; for all men have, implanted in their nature, some portions of Divine fire: this they are left to move, and act by, and feed, and nourish this spark by, rightly modified, matter; (the Modification of which is, altogether, in man's power:) all flame is either more pure, or gross, according to the pureness of the matter of which it is compos'd; and the purification of all matter consists in resolving, and making minute, its parts; which parts are so resolv'd, or ground, by some quick motion. The constant, quick, and brave, motion of the Soul of man is (what we call) virtue: and vice, is drowning, or causing that motion to cease by a cowardly, contracting, or hiding, of the Soul; not daring to let it appear to the world; lest its foulness should be conspicuous. By thus locking up the Divine operations of the soul, the

matter which, in the stomach, is resolv'd into *Chyle*, and, by the *Veins* and *Arteries*, with the *blood*, is turn'd into *Spirits*, fit to be joyn'd, or added to the *Animal Soul*; these *Spirits*, by the *Soul's* contraction, (the office of the *Soul* being, by its continual motion, to resolve matter into the finest, and most minute, particles) are too gross to admit of so noble operations as *Diviner Spirits* are fram'd for; and, by a continual succession of these grosser particles, those pores, which were adapted to frame proper *Spirits*, for the *will*, and other faculties of the *human Soul*, are so dilated that they quite change the nature of the parts; and bring forth fruit quite different from what was design'd by the first framer of the *Organs*: as in *Vegetables*, each branch has pores to strain the juice; which, from the root, flows in a grosser substance, and fits it to bring forth fruit according to the Nature of the pores, through which it is

A 3 strain'd;

strain'd ; if these pores, for want of
 pruning, or other neglect of the bus-
 bandman, are too much dilated, the
 nature of the fruit changes. The un-
 happiness of Devils and incorporeal
 Spirits (improperly so call'd) con-
 sists in that, by consciousness of their
 own foulness, they dare not exercise
 that motion which was in their power,
 for, by that means, they must be
 forc'd to throw off that clog of matter
 which bides their treachery, and perfidi-
 ousness. In happy Spirits every thought
 of the Soul is seen, at first glance ; as
 purest water through clearest Cristal :
 'tis plain that nothing is Vice but a
 confining the motions of the Soul : and
 Vertue but the exercising its motion,
 and getting rid of those deformities,
 which make it ashame'd to be seen ; and
 sherefore chuses the deepest and darkest
 recesses in matter, foolishly thinking
 there, to conceal its conscious crimes ;
 by how much the more wicked the
 being

being is, that thus wou'd conceal its deformities, by so much the more anxious, consequently, must it be, to clog it self the deeper in matter to bide all its foulness.

C H A P. II.

Of Body and Spirit, join'd.

I Suppose all men will own that whatsoever has a Being is either Body, or Spirit : or, what is the same thing, is either body, or not body : for to believe that, where body is not, there is an absolute *Vacuum inane*, is, to me, absurd : tho' some, perhaps, for Argument sake, may seem to maintain it. To satisfie such persons, I beg leave a little to argue the point, and consider what sort of apprehensions we can have of those things which are not bodies ;

no other thought of them can be conceiv'd than that they are space, or places, fit to receive Bodies into ; if so, they have what Philosophers call UBI, or some Existing place, and consequently must be occupied by Spirit, at least the Divine Spirit, whose most noble attribute is Ubiquity or Existence in every place.

If this be granted (as I think no reasonable person can deny ; for all Philosophers have held a Universal Spirit, or *Anima Mundi*) it will follow that, dull, unmoveable matter being, at any time, plac'd in this space, must, necessarily, have its parts operated on, and put into motion by this nimble Spirit ; whose whole perfection lyes in its continual motion.

The Universe has always been represented, to mens fancies, by a vast, immense space in which are interspers'd lumps, or heaps, of matter : 'tis plain, from what has been suppos'd, that this

this space, or Spirit, or *Aether* (term it what you will) being endued with so quick a motion (motion being the only apprehensions we are able to have of Spirit) must operate, and move, with it, the parts of matter ; and, consequently, heat, dissolve, or melt it ; for heat is only the moving the parts of body and its degrees are greater, or less (according to the greater, or less degree of swiftness in the motion :) as, its opposite quality, Cold is a cessation, in some wise, of that motion ; one body seeming cold in respect of another; as its parts are less agitated than those of another.

Supposing then, according to my former Principle, a rude, and indigested heap of matter (such as the CHAOS of this Earth may be suppos'd to have been;) consisting, indiscriminately, of two sorts of particles; Aqueous and Oleagenous: but so that the Oleagenous parts may be suppos'd to be lock'd up in the

the Aqueous ; this plac'd in such a space, or spirit, as has been describ'd; the consequence will be, that when matter is so finely resolv'd as to be kept in a continual motion by Æther (for so I would term what I mean by Universal Spirit or *Anima Mundi*) it must be so incorporated with it, as to compose what we call, fluid bodies; which, in particular, may be thus defin'd.

Air is a fluid body consisting of the Aqueous particles of matter ; resolv'd, borne up, and kept in a continual motion by Æther. Æther is a fluid body consisting of the most subtile particles of matter, very spiritual, preying, and hungry, uniting, as well, with the oleagenous, or combustible, parts of matter, as with the aqueous ; but, when clog'd with either, will not admit the other : when 'tis joynd with the Oleagenous parts of matter, 'tis called Fire; when with the aqueous parts, 'tis call'd Air, or Water; and when it departs, or re-

cedes from any body it leaves the body solid, and without motion. This notion will be better understood from this plain parallel.

Aether, which is much more *subtil* than *flame*, (for *flame* is a qualifying or clogging of *Aether* by the *oleagenous* parts of matter mix'd with it ; tho, at the same time, with this different property ; that *Aether* will admit, and joyn, with the *aqueous* particles of matter ; and *flame* will not : for, in *flame*, the *Aether* is, already, clog'd with the *oleagenous* parts of Matter.)

Aether, I say, may be represented by highly rectified *Spirit of Wine* ; which is a *fluid*, whose parts are in the greatest motion, of any body, that can be contain'd for our use ; and *Aether*, or *Spirit*, can be distinguished, by no other property, than the *swiftness* of its motion. The word *Body* (or this *terrestrial Globe* upon which *Aether* operates) may fitly be compar'd to an *Almond*, *or*

or other Nut ; consisting both of aqueous, and oleagenous, parts ; placing this Nut (compar'd to the Mass we vulgarly call earth) in high rectify'd spirit of wine (compar'd to Æther or the Menstruum that earth is dissolv'd in) it will follow, that the Aqueous parts will be first operated on, and dissolv'd by the quick motion of the spirit of Wine ; and (if the aqueous particles prove sufficient to clog, or stay the pressing edge of the Spirit) the oleagenous, or oily, parts will remain undissolv'd : if the watry parts prove not sufficient to glut the Spirit ; some, or all, of the oleagenous parts, will likewise be dissolv'd. This will further be explain'd under the title of Fire.

S E C T. I.

Of W A T E R.

AS, in the former comparison, Spirit of wine (being clog'd by the particles of the Nut, or any other

body

body) will (its body being weaken'd by the addition of a fluid, whose parts are in less motion, as those of common fountain water) let go its hold and let the, formerly dissolv'd, body, which was incorporated with the spirit of wine, now sink to the bottom of the glass which contains it ; [this Chimists call precipitation :] so the *Æther* (to which the Spirit of wine bears an Analogy) being clog'd with the aqueous parts of matter, which before swam, and were born, on its wings in the form of Air, (the spring of the *Æther*, being weaken'd by the intermission of some part of the Atmosphere, of some other Planet,) gathers it self, first, into clouds, and flows on the top ; till, by its own weight, it, at last, settles, and falls down in showers of water ; in which so much of the *Æther* remains, as is able to keep the parts of water fluid, or in motion ; or it is congeal'd by the departure of *Æther*, being employ'd another

ther way ; and then the whole Air is affected by its *unactiveness* : and every body, whose parts are in motion, undergoes some sensible *let*, or *obstacle*, to its *motion* ; the perception of which is termed *cold* ; and the *congeal'd*, or *unmov'd*, particles of *Air* that thus, un-friendly, disturb the motions of their neighbouring *Bodies*, are call'd *Snow*, or *Hail*, when they fall to the *earth* : if they are too small, and light, to sink to the bottom of *Air*, but flow in it (as the particles of *dissolv'd sugar in water*,) tis then call'd *Frost* ; and its *sediment*, which it casts from it, *Hoar* : which, to appearance, resembles *Snow*. A notable comparison of this may be observ'd in what Chymists call *Lac*, or *magisterium Sulphuris* ; milk, or *magistry of Sulphur* : the *Sulphur* (being *dissolv'd* in *water* by *boylng* with *Salt of Tartar*, or *Quicklime*, which are call'd *Lixiviate Salts*) affords a liquor very red ; the smell, and taste, denoting it

to abound with very many of the dissolv'd particles of the Sulphur: to this liquor, adding a sufficient quantity of Spirit of Vinegar, or any other acid, whose particles may lay hold on the particles of the lixiviate salt, which kept the water in sufficient motion, enough to hold up, or bear; the dissolv'd particles of Sulphur (for the moving of the parts of a fluid is what gives it a greater, or less, propensity to dissolve, and bear up, matter; incorporating it with its own body: such are Tinctures, of all sorts, by the highest rectified Spirit, or Alcohol, of wine which has its parts in the swiftest motion of any body perceptible to us: for a body, whose parts are more in motion, would be equally, or less, thin, than Air (the Medium by which we see, and judge, of all things) and, consequently, not perceptible the acid particles having arrested the parts of the lixiviate Salt, which gave motion to the water to bear up

up the dissolv'd particles of the Sulphur, which the heat of the fire had resolv'd, the particles of the Sulphur gather themselves in white clouds towards the surface of the Liquor ; and, being too heavy, long, to continue there, it fleets about, (as clouds on Air) until by its own weight 'tis subsided into a white powder : This only difference happens in the comparison, that clouds, swiming on Air, fall down, sometimes, in a fluid body, whose parts are kept, in a continual motion, within themselves, viz. water ; the cause of which is, because Æther, continually, receiving a supply of new Aqueous parts from the earth which compose the Air, must, of necessity, thrust upwards more than the Æther can mix, or incorporate, with its body without too much locking, or binding up, its motion ; therefore it casts it off : but in this expurgation the exploded parts lay hold of as much of the Æther as will suffice to keep them in

continual motion : and , in this form state, the body water which is the *simplest fluid* ; and (its parts being the *grossest* for want of having suffer'd some greater *motion*) the *heaviest* of all *fluids Per Se.* If, at any time (from any part of *water*) the *Æther*, or *motion*, depart ; the *water* is left *motionless*, and *congeal'd*.

S E C T. II.

Of S A L T.

Salt is compos'd of the *heavier* parts of *aqueous particles* engen-
der'd, and receiving a peculiar *disposi-*
tion from the *Air*, in which it flow'd,
and of which it was part, thrown
off from the *water*; and together with
it falls to the *earth*: where, *congeal'd*
by the *departure* of *Æther*, which,
B before,

before, kept its parts in motion (congelation, or glacination, being nothing but cessation of motion, as Mr. Boyl, experimentally, proves, in his *History of cold*) it appears a dead, solid, body; tho easily (it having been once dissolv'd) made fluid: and unitable with, almost any fluid.

It may not here seem impertinent to add an observable, and known, effect of common Salt when joyn'd with Snow, or ground ice, freezing water, and other liquors, in a very short space; Salt Armoniack dissolving in common water, as Mr. Boyl observes, has the same effect; the reason, according to our Hypothesis, must be this: Viz. that any motionless, or solid, body entring into a State of fluidity, must receive \AA ether from its neighbouring fluids; whether Air, or Water: now if water be at one side of the glass, whilst the Snow and Salt are dispersing on the other; the motion,

motion, which the Snow and Salt together endeavour to obtain, causes the Æther, which before kept the parts of the water in motion, to quit that, and joyn with bodies which seem to have more immediate need of its assistance. It is evident that, before Snow and Salt can obtain a fluid form, they must receive their Æther, or motion from some body that has it: which must either be from fire, air, or water: for Æther, purely of it self, has no subsistence, or cohabitation with terrestrial bodies: if fire, and air, be removed, at a greater distance, from the Snow, and Salt, (dissolving themselves in a fluid body) than water; 'tis rational to believe that the Snow, and Salt, must receive their fluidity from Water. The like effect happens to the Air: the parts of which may be observ'd to stick upon the outside of the glass; containing snow, and ice in perfect streaks of it.

S E C T. III.

Of FIRE.

Fire is a body whose *motion* excels any other *motion*, perceptible by *Human sence*; and is compos'd of the lighter parts of *matter* joyn'd with *Æther*: Viz. *oleagenous* (for the oily parts of *matter* are *lighter* than the *aqueous*; as appears by their swimming on *water*.) This may be prov'd from its *production*, at what time soever the *watry* parts can be separated from the *Oleagenous*; and, at the same time, the *Oily* parts of *matter* being resolv'd into sufficiently minute particles, to be laid hold of by *Æther*; in that quick separation, fire will thence ensue; as is seen in the concussion of great bodies: where, by the violence of their meeting, the *aqueous*

aqueous particles, suddenly, receed ;
 and some parts of the struck body is,
 at the same time, resolv'd ; thence
 sparks of fire emane. The same hap-
 pens when steel, and flint are struck
 together. Fire once thus produc'd,
 will submit as long as 'tis supply'd
 by the Oily parts of matter ; for tho
 Æther will mix either with the oily,
 or watry, parts of matter ; yet when
 it is joyn'd to the one, it refuses to
 admit or incorporate with the other :
 and the Aqueous parts, being so dis-
 pos'd by the Creator, are first laid hold
 on by Æther : nevertheless Æther
 seems to have a much nearer affinity,
 and greater inclination to joyn with
 Oyl parts of matter ; than the watry :
 because the first (as being lighter
 than the latter and more easily
 mov'd) comes nearer its own nature :
 therefore wheresoever Æther is joyn'd
 once with the oyl parts of matter,
 and there finds a supply of Oyl or
 combustible parts, it drives, power-
 fully,

fully, away from it all aqueous parts; as being, absolutely, heterogeneous to its substance: and receives no parts but such as are homogeneous, and will unite with it.

With how much Violence it opposes, and drives away from it, the aqueous parts of matter; the noise, and commotion it makes, in the ambient air, demonstrates: and the more, by how much the matter, it feeds upon, is fitted and adapted, to its sudden reception: so Sulphur, and Nitre (commonly call'd Gunpowder) joyned, by its sudden resolution, causes that surprizing noise to the amazement of any not aware of such effects.

Lightning, and *Thunder* proceed from the same Causes; as, in the former comparison, the Nut in the Spirit of Wine; in defect of aqueous particles, enough to satiate the eagerness of the Spirit, some of the oyly parts are also resolv'd by the Spirit; so that the Ether

(having absorb'd great part of the Aqueous particles that it meets with, on the Surface of the earth) must then employ it's force on the oyly parts ; which it also resolves : the Oyly, being lighter than the watry, mount uppermost ; where, at last, getting head, and uniting among themselves (as Oyl, tho' ever so diper'd in water, will, at last, all unite in its own body ; and *Swim uppermost* :) flow on the clouds until, by the violent meeting of vapours, the watry parts, that they flow'd in, are suddenly bearen away, and give room for the *Aether* to lay hold on the Oyly parts of matter ; which it resolves, with all quickness ; and appears, in flashes of lightning, before the thunder is heard : because objects move much faster to our Ears than Eyes (as in the firing of a Cannon the fire may be perceiv'd some time before the noise is heard.

And, as has been hinted, that by how much the more *Subtile* the oyly

matter is, that joyns with the *Aether* in composing fire ; by so much the more *subtile* the fire. Nothing therefore can be suppos'd to have its parts more *refin'd* than that matter that has been *absorbed* by *Aether* ; and carry'd into *Air*. *Sulphur* and *Nitre* receive their *wonderful disposition* (so suddenly to be resolv'd by *Aether*) from no other principle than having been *fluid bodys* ; and joyn'd with *Aether* : tho by reason of some *allay* of *watry parts*, their *Substance* was never *resolv'd* into *fire*: but on the contrarywise, by the *departure* of *Aether*, they are left *solid bodies* ; abounding, so much, with *Oyl particles* ; that they are, suddenly, *inkindled* by the least assistance of a *Medium of fire*.

This may, in some measure, remove the *surprise* men are wont to have at the *effect* of *Lightning* above other *fire* ; and, particularly, that *wonderful effect* of melting *metals*, *keys*,

mony, &c. in the pockets of some that have, miserably, perished by it, without damaging the cloaths they wore : and melting their swords in their scabbards ; without consuming their scabbards.

As for the vulgar opinion of thunderbolts there is no ground for it ; except the fancies of some ignorant people : and any one that has observ'd how great a motion the Air is put into when a great Gun is fir'd (the Shock of which goes near to overturn the by-standers) will not wonder at the effects of thunder in throwing down houses, and trees, &c. only by the sudden and violent, motion the Air is put into by the meeting and concussion of two or more Vapours ; since winds alone have been able to effect so much.

But here may be objected ; that if it were only a motion of the Air, why does it not in effect bear a greater Latitude than is observ'd ? for relations, of this kind, intimate the ruins, sometimes,

times, to appear no greater than if a single Cannon Bullet had pass'd through them: this objection will be answer'd, if it be suppos'd that the ruin happens, at the same instant, with the flash of Lightning; and that it does not wait the leisure of the noise, which is, vulgarly, call'd Thunder: consequently the ruin can be no greater than the separation of the aqueous parts, in which the lightning flows. The sudden, and unusual, separation of the Air, is what destroys bodies before us'd to calmer motions. It may, again, be objected that if the oily parts of matter are lodg'd in the upper region of the Air, and there fired; how is it possible for fire, which is a lighter body than Air, to descend upon these lower borders, as if only, spightfully, inclin'd to ruin, it shoud even, to accomplish its purpose, pervert the laws and rules of nature? to this great objection I return this answer, viz: That if in water, or any fluid, there

there be suddenly taken away, or separated from it, part; the whole fluid, according to the surprize of this motion, will be more, or less nimbly agitated. The same happens to the Air, for some part of it's body joyning and leaving, all of a sudden, its station; the Air that is, in a direct line, under this separation, will, immediately, at the departure of any body that press'd it down, and kept it in its place, fly upwards to cause an *Equilibrium*; which all fluids require: consequently this motion must be succeeded by another motion of the Lateral Air, or that which is on every side of it; which, immediately, jumps into its place: therefore from the flying upwards of a certain colume of Air, and the motion that the lateral Air causes by jumping into its place, I suppose the effect of Thunder to proceed.

S E C T. IV.

Of the Moon, and Stars.

THE Moon is a body consisting of Aqueous, and Oleagenous, particles ; as the Earth, whose Atmosphere is contiguous to that of the Earth : and, being a purer Medium, attracts that part of the Atmosphere of the Earth, which in its motion interferes with the Atmosphere of the Moon ; and, thereby, causing the ebbing and flowing of the Sea ; and Winds, of all kinds, which must, of necessity, follow the motion the Air is put into by the attraction of the Moon : for if any part of a fluid body be attracted, or put into Motion, the whole fluid must flow to that point to make an \mathcal{E} quilibrium (which causes wind, and the Motion of the Sea) is plain from the doctrine of Hydrostaticks : for if the pressure of the Atmosphere,

Atmosphere, which presses on every part of the *Surface*, of the *water* with an equal weight, be lessened, in any one point ; (as it is by the *Attraction* of the *Moon*) the *water* must, from every part, flow, from that point, to make an *Æquilibrium*. This attraction, from the *Atmosphere*, of the *moon*, is caus'd because the *moon* may be suppos'd to be of a different *Substance* ; and have an *Atmosphere*, specifically, lighter than the *Atmosphere* of the *earth* ; and the *Æther*, which has dissolved some of its *Substance* into an *Atmosphere* of *Air* which is about its *body* (as our *Air*, surrounds us) may not be so clog'd with the parts of its own *body* ; but that it may be *capacitated* to receive, and *keep* in motion, some particles of the *Atmosphere* of the *earth* : and, by this means, receive some parts of another, and differing, *body* and mix and joyn it with its own : as *water*, tho' clog'd and glutted with common *Salt*, insomuch

much that it will, by no means, *dissolve* any more, it, notwithstanding, will dissolve Sugar, and other Salts of differing particles.

But here may be objected, that the Atmosphere of this Earth may as well be supposed to receive some of the parts of the Atmosphere of the Moon. To this I answer, that, if that were suppos'd, no absurdity would follow; but it may, as well be suppos'd not: or, if at all, but in a very small quantity, in comparison of the moon; for the particles, that compose the atmosphere of the moon, may (rationally enough) be suppos'd to be more refin'd, and consequently lighter, than those that compose this Air we breath in. If then water, which may resemble this Air, and, a lighter fluid, as Oyl, resemble the Air, or Atmosphere, that surrounds the moon, meet: if water, I say, meet with, or be poured on, the Surface of Oyl; it will, immediately

mediately, sink in the *Oyl*, and mix with it ; tho not incorporate : but the same will not follow, if *Oyl* be poured on the Surface of water : for the *Oyl*, being the lighter fluid, will not sink, but swim on the top ; and so can neither mix, nor incorporate, with the water. The Application is evident, viz, that the particles of the air, we breath in, may, when they meet with the Atmosphere of the moon, be absorb'd, by sinking in that lighter Medium : yet the same will not, reciprocally, follow, when the Atmosphere of the moon meets with the surface of the Air ; it cannot be absorb'd, by the Air, because it is a lighter fluid : and cannot sink in it. The same may be said of all other Planets whose Atmosphere are all contiguous one to another : a Scheme of which would be foreign, from my purpose, here to insert. Nor does my allowing each to have an atmosphere, (whose particles may be very much different

ferent in quantity, and form, from those of the earth, as well as of each other) contradict (what I would affirm) that they have all *Atmospheres*: as the air consisting of the aqueous parts of matter, dissolv'd and kept in a continual motion by *Aether*. For by asserting that this Air consists of the aqueous parts of matter, I do not confine my self, so close, to that principle, as to deny an allay of oyly particles, to insinuate themselves, in some seasons; as, particularly, in *Summer*; the Explanation of *Lightning* and *Thunder* intimating thus much: consequently an allay of oyly particles, in a more, or less, degree (as the *Atmosphere* is of a purer nature,) I must ascribe to each of the *Planets*: and, the more they have of this allay, the purer is the *Atmosphere*. But I must suppose the basis of all the *Planets* (except the *Sun*) to be compild of aqueous particles; otherwise it would be fire: and consequently, so resol-

ving,

ving, that few, or no body, could endure its operations.

Of the S U N.

THE Sun is a body consisting either, intirely, of Oleaginous particles, ; or, if it admit of aqueous, 'tis but as our Air admits of oleaginous, as it were by stealth ; to qualifie the, too violent, disposition of its antagonist. Thus far I will not altogether, abstract aqueous particles from the body of the Sun ; to temper its, too swift, motion : which might be pernicious to adjacent bodies. This will explain the effects that are observ'd to proceed from the Sun : how it causes heat, and how (by the help of glasses, and other instruments) fire, by this means, will seem no mystery : it will not be unreasonable again to repeat the nature of heat to be nothing

but motion; and motion being locked up by too great a clog; of matter it's contrary quality [Cold] to ensue.

The nature then of the Sun (the motion of whose Atmosphere cannot be so well check'd by the oyl parts of matter as the same \mathcal{A} ether is in the Atmosphere of the earth, and other planets, by the aqueous) differs from that of other planets; in the pureness of its Atmosphere, and swiftness of its motion: and, by that means, engrosses to it self a greater space, or Atmosphere; by how much the easier the same \mathcal{A} ether can keep up, or in motion, the lighter particles of Oleaginous matter; than it can the heavier parts of aqueous bodies: and, by its large extent, obtains a vicinity, or contiguity, with all the planets. In which number, if Earth may, very well, be included (according to some philosophers who have judg'd the Earth to be a planet) it must, therefore, by its contiguity, attract, or (as has been

been argued before) some of the heavier parts of aqueous matter must, sinking, be absorb'd by the lighter parts of the Sun's Atmosphere : which (if it so happens that the Air has before been clear, and not over-clog'd with aqueous particles) must cause every intense motion of those aqueous parts, that remain in the Air ; and, consequently, heat, if the Air has been overcharg'd with aqueous particles ; and that they have cast themselves off into clouds. These clouds supply the rarified Atmosphere ; and qualify the intenseness of the heat : as also do the north winds which bring the congeal'd particles of matter from those parts of the Earth ; to which the Sun is very remote : and the Sun, so seldom, comes near those regions that the motion of the air, there, is exceeding slow.

Of Congelation, or of Solid Bodies in general.

ALL Minerals, and other bodies, before they become solid, have their particles prepar'd, and made minute, by fluidity: Which fluidity is nothing else but the particles of dispos'd matter, being dissolv'd by *Aether*, and too heavy to mount into *Air*, lay hold, notwithstanding, of a sufficient quantity of *Aether* to keep their parts in a continual motion; and thus flow, so long, till the particles, by reason of their extreme minuteness, or other disposition, no longer suffer the continual Succession of *Aether*; which, in all fluids, is required, and, consequently, the innate *Aether*, not being sufficient to keep its parts in motion, suffers them to congeal into an unactive solid. The particles of all baser minerals

rals adhere to the *parts* of water, which introduce themselves thereby through the *Bowels* of the *Earth*: and, according to some *disposition* in the *earth*, either a former *Randezvous* of such *particles* (by the *conformity* of whose *parts* they are laid hold on, or that the *water*, in which they flow'd is no longer able to bear them; by these, or some other *dispositions*, they are left *unactive parts*: and the *continual intercourse* of *water*, laden with the same *Cargo's*, afford them opportunity to seize, and lay hold of, *particles* of their own *nature*. For, as *Iron*, (and all solid *bodies*) does cause a, sensible *coldness* to any *body* whose *parts* are in a greater *motion* than its own: consequently if there be such an *endeavour*, in these *bodies*, to stop, or seize on, the *motion* of the *warmer parts* of *animals*, which its *coldness* indicates (*cold* being only the *cessation* of *motion*) this *endeavour* must also have some effects on the *parts* of *inse-*

sible bodies : whose parts are likewise in a motion; (tho not so brisk:) and, by this means, stagnate them (as they are diversly dispos'd) into Salt, Vitriol, Nitre, Sulphur, Lead, Tin, Iron, &c.

S E C T. VII.

Of Quicksilver, and Fluid Gold.

TH E particles of mettals being made solid, scarce content themselves with the sluggish form nature has allotted them: but by a fresh ingress of Æther, (receiv'd from some neighbouring fluid which, first, resolves, and makes its parts very small; and then, lovingly, affords it part, sometimes all, it's motion) continually, into their parts, are, again, dissolv'd; (this is plain from the fluidity, all mettals receive from fire; which is much grosser than

than *Æther*; being *Æther* joyn'd with the Oyl parts of matter) and, as it were, again purify, and refine, themselves from their dross, (or those parts which were not made minute enough to associate, or flow, along with them) which they leave behind; in order to afford more pure, or minute, particles from the purest bodies: and, while these particles keep the *Æther* there receiv'd, and admit fresh supplies of *Æther* to be introduc'd betwixt its parts, they continue fluid: for, otherwise, as in mettals, melted in fire, upon the departure of the fire, which kept them fluid, they acquire a solidity; so if quick silver, and other fluid minerals were not supply'd by a continually ingress of *Æther*, their fluidity must, of necessity, cease; because all minerals, lighter than Mercury, may, probably enough, be suppos'd to be engendred, from the mixture of the metalline particles; which in small chanel's, flow with the water, and is laid hold

of by the *Mercury*: in which conflict they fix one another. *Gold*, that is heavier than *Mercury*, ought to have another, and heavier, fluid principle, than *Mercury*, ascrib'd to it: whose *specifick gravity* should, at least, *balance*, if not exceed, the *specifick gravity* of *Gold*; to believe that in some of the secret recesses of *nature* (tho' she may, all this while, have nourish'd this living *fetus* within her own *bowels* so as never, yet, to have produc'd so pretty a *Spectacle* to the *World*) there may be such a *Mercury*, or *ὑδραιχνος*, that may have notable difference from the common *Mercury*, *ὑδραιψυρος*, to me, seems ingenious enough. Something, of this nature, seems to have been found by a curious English Gentleman; who, giving an account, unto the Royal Society, of his *Voyage* to *Mexico*, and of the minerals of that Kingdom, relates a circumstance, wch taking notice of, in this place. " I was once (says he) de-

sired

" fired to visit a famous cave
" there some Leagues from
" Mexico, on the North-
" west side of the City, be-
" yond the *Lake*; this was said to be
" gilded all over with a sort of *Leaf-*
" *Gold* which had deluded many Spa-
" niards with its promising colour;
" they never having been able to reduce
" it into a body, neither by *Quick-silver*
" nor *Fusion*; tho' the fame ran that
" the *Antient Indians* knew how to
" make use of it: and that the great
" Montezuma had borrow'd, thence, a
" considerable part of his *treasure*. I
" rid thither one morning taking with
" me one *Indian* only for my guide,
" with a *tinder-box*, and a *candle*, and
" some other *Instruments* for my de-
" sign. I found it situated somewhat
" high, in a place very convenient for
" generation of mettals; but the mouth
" so barricaded with stones, that both
" my *Indian*, and I, had work enough
" to

*Transact of
the Royal
Society.* 41.
numb.p.818.

" to clear the passage for my entrance;
" which being open'd, I went in with
" my candle lighted, but could not
" make the Indian follow me: being
" afraid of Spirits and Hobgoblins. The
" light of the candle soon discovered
" to me, on all sides, but especially
" above my head, a glittering Canopy,
" of the said Mineral leaves, at which,
" I, greedily, stretching forth my hand,
" to reach some parcels of it, there
" fell down, presently, so great a
" lump of clotted Sand, on my Head
" and Shoulders, that it not only put
" out my candle, but my Eyes also;
" and calling out, with a loud voice,
" to my Indian, who remain'd at the
" mouth of the entry, there rebounded
" within those hallow caverns such
" thundring, and redoubled Echo's,
" that I admir'd it: and the Indian
" imagining, by those tumultuous
" Voices, that I was wrestling with some
" infernal Ghosts, soon quitted his sta-
tion;

" tion ; and, thereby, left a free pas-
 " sage for some rays of light to enter ;
 " and serve me for a better Guide : my
 " light, mean while, being, not a
 " little endanger'd by the corrosive Acri-
 " mony of that mineral dust. Having
 " got my candle lighted again ; I pro-
 " ceeded in the cave : and heaped to-
 " gether a quantity of the Mineral mix'd
 " with Sand : and scraped also, from
 " the Superficies of the earth, a quan-
 " tity of the same kind of Glittering
 " leaves none of which exceed the
 " breadth of a mans nail ; and, with
 " the least handling, they divide them-
 " selves into many lesser spangles : as
 " with a little rubbing they leave ones
 " hand all gilded over like gold.

" I knew well enough that the or-
 " dinary tryals made by the Indians,
 " had proved fruitless upon this Mi-
 " neral ; for it could neither be reduc'd
 " into a massy form by the violence of
 " fire ; nor separated from its Hetero-
 geneous

" geneous Substances by the mild tryal
 " of Quick Silver , yet on the Touch-
 " stone it equaliz'd the most refined
 " gold : so that there wanted nothing
 " but to reduce it to a fusible mallea-
 " ble Mettallick form ; which, soon,
 " would be accomplish'd if it could
 " be made to take Quick-silver .

What may be infer'd from this re-
 lation, I am not about, now, to en-
 quire : my business, at present, being
 only to insinuate a probability of the be-
 ing of some fluid body ; whose specifick
 gravity shall exceed quick-silver : which
 will seem, to an unprejudic'd person, the
 more reasonable, if he considers that even
 in quick-silver, it self, according to the
 climate it was nourish'd in, and accord-
 ing to its refinedness from dross, there
 is some remarkable difference in speci-
 fick gravity .

And, that the, foremention'd, gilt
 leaf, had been a fluid, whose specifick
 gravity did excel the specifick gravity of

quick-silver, seems to be concludable from its equalizing, on the touchstone, the most refin'd gold : for whatsoever affection, or disposition, gold shews by discovering its sympathy, or antipathy, to any body, above Silver, or other, lighter, minerals ; can be attributed to no other quality than its specifick gravity (or having fewer, and less pores.)

In fine, the whole description seems to intimate, that this strange mineral can be nothing else than a yellow Mercury, kill'd (as we usually term quick-silver when its parts, by straining through leather, or otherwise, are so separated, that its particles lose the connexion, they had with one another, by the mediation of Æther : by whose absence, Air, in the kill'd quick-silver, insinuates it self between its particles) by the interposition of some Sulphurs, or oyly, particles, joyn'd with the Air ; however, it were to be wish'd, that the tryals made upon it had been more satisfactory ; and that

that instead of trying, to make it fusible, they had endeavour'd, by distillation, or other means, to have reduc'd it to a fluid form.

S E C T. VIII.

Of the perviousness, and transparency of glass. The clearness of Ice, and opaceness of gold and other solid bodies.

ANY body, that receives fluidity, or motion, acquires that state by the ingress of *Æther*; to which end it robs, or deprives, some other body of either part, or all, its motion (or *Æther*,) to put it self in a capacity to be rank'd amongst the superior order of fluid bodies. As a bowl that's struck, or put into motion, by another bowl,

which

which receiv'd its motion from the hand of a bowler ; by how much motion it receives, by so much less motion does it leave in that, from which it received its motion. Every body, that has obtain'd a state of fluidity, or motion has received this motion by robbing one of these three bodies, water (under which head I include all liquids) air, or fire. The materials that form all diaphanous bodies, that are not liable to be destroyed by the motion of the Air, receive a fluidity from fire : which state of fluidity (to make very transparent glass, and free from bubbles) must be so long, and the motion so great, that every particle of the matter, of which glass is made, be reduc'd, by its constant circulating with fire, to almost, as great a degree of minuteness as the particles of fire themselves.

And tho' this matter, in this degree of fluidity, and minuteness, should be remov'd from the fire, the parts indeed,

deed, contiguous to the *Air*, would find themselves oblig'd to part from their connexion, with the particles of fire ; but those parts that were more remote, from this assault, and skreen'd, as it were, from the violence of their adversary, by the superficies of their neighbouring, and exterior particles, lay hold on, and embrace, the particles of fire, which the *Air* endeavours to rob them of, with so much eagerness, that notwithstanding the efforts of its enemy, it keeps, and locks up, within its body, some of the particles of fire, to which, by its long union, it had, almost, assimilated its parts. Thus do the particles of the fluid materials that compose glass, upon their parting with the particles of fire, that kept them in continual motion, separate themselves into infinite numbers of small bubbles, whose cavities are fill'd with imprison'd particles of fire ; mix'd with the most minute, or fine particles of the matter, with which

which they were incorporated; and together, in their little *cells*, or *prisons*, keep themselves in a fluid state; and, continually, dance round their bounds.

The like happens to *water*, when its neighbouring *Air* (being it self assaulter, and robbed, of some of its motion, by the congeal'd particles of matter, that *fleat* in it) takes from it its fluidity, or motion, to supply, or make up, its own loss of motion: for the *air* makes its first assault on the outer superficies of the *water*, which is adjacent to it; and, by degrees, insinuates it self further, till all the motion, or *Æther*, which the *Air* has not robbed it of (for it never can deprive it of all) be confin'd, with some of the finest of the watry parts of matter, in little *cells*, or *bubbles*, where they keep, and retain, their own fluidity within their own limited *spheres* of activity.

Vid. Mr. Boyle's History of Gold;
Title the IX. concerning *Bubbles.*

These little *Atmospheres* of *Æther*, (which are clog'd in congeal'd water, or ice, with sufficient aqueous particles, to keep, and contain them within the bubbles) cause the congeal'd water to expand it self; and occupy more space than the water did before congelation; because the *aerial matter* (tho' lighter than *Air*, yet may be compar'd to it; both being an union of *Æther*, with the aqueous parts of matter) is much lighter than the same bulk of water; and, consequently, occupying the space that water was, before, in, must force the water further out, and cause it to occupy more space in its state of glaciation, than it took up in its state of fluidity.

This is consonant to some experiments made by Mr. Boyle in his *History of Cold*: under the Title concerning

Vid. Mr. Boyle's *History of Cold*, p. 86. the expansion of water, and aqueous Liquors, by freezing.

One experiment is, that having set a bolt head, with a long slender shanks or stem, in a mixture of ice, or snow, and salt, so that it may begin to freeze at the bottom of the glass; (to avoid the inconveniences that might happen, by the water's, first, freezing at the top; for then the expanding of the water must either break the glass, or force the ice, that is on the surface of the water, farther up) the ice did reach a good way higher in the neck, or stem, than the fluid water had done before; and upon thawing, the water did fall, and rest, at the part of the stem, where its surface touch'd, before it was expos'd to be frozen.

This causes the clearness that is to be observ'd in ice, and its resemblance to glass, or crystal; tho' the little bubbles in ice are fill'd with an aerial substance, too gross to be equally pervious with either of them: for in many tryals, I cou'd never find a leak of

ice, tho' ever so thin, and clear, that was diaphanous enough to suffer the largest print to be read on the back-side of it.

But the little *bubbles* which are innumerably interspers'd in glass, are fill'd with a quite different matter; which has a great and near affinity to the particles of light; being *Æther*, joyn'd with the *oleagenous* parts of matter, (for when glass was in its fluid state, it can't be suppos'd that any aqueous particles were admitted near it) and consequently suffers light, which is also an *union* of the finest of *oleagenous particles*, with *Æther*, to have free ingress, and regress; the pores, all this while, of the glass, being too close to suffer any aqueous particles to interpose, or enter, into the glass, to vail the object which appears on the other side of the glass: for bodies are *opaque* upon no other account than that they interpose, between the eye, and the

the object, particles more gross than those of the air, in which the object is perceiv'd ; and no object can be perceiv'd that has particles more minute than the air : but the particles of glass were, in the state of fluidity they receiv'd from the fire, every one of them, reduc'd, almost as small as the particles of air ; and the fluid medium, that is contain'd in the bubbles of glass, when it is congeal'd, has its parts much more minute than either the particles of air, or fire ; so that the minuteness of these particles make sufficient amends, for the difference that is, in bigness, between the particles of matter, of which the glass was made, and the air, in which it is perceiv'd ; for, in looking upon it, the particles which are, indeed, more gross than air, by being reflected on by a medium that is extreamly more minute, seem, to the eye, to be more minute themselves than air ; so that when glass interpo-

ses betwixt the object, and the eye, it, very little, shades, or darkens, the object; its particles (by the reflection of the fluid medium in the bubbles) seem smaller than the particles of the air: these little cells, or bubbles, fill'd with a fluid body, of the same nature with flame, keep a constant correspondence with the particles of light; which has a free intercourse to the particles that inhabit these little bubbles.

S E C T.

S E C T. IX.

Of the brittleness, and malleableness, of Metals ; to which are premis'd some reflections on the difference, betwixt Fluidity, and Firmness.

WHAT has been said of ice, and glass, the manner how they lose their fluidity, and receive a solid form, may give some information to a diligent enquirer, into the nature of firmness, and fluidity.

In all fluid bodies, there is a quantum of rarified air contain'd in an infinite number of small bubbles ; but so that if any part, of the fluid body, suffer the air, that is contain'd in these bubbles, to be more rarified, or condens'd, the bubbles, of the whole fluid,

do, immediately, break, and mix, their air, with the more rarified, or condens'd, air, of their neighbouring bubbles, to make an *æquilibrium* in the whole fluid; by how the much more rarified the air is, that is contain'd in these bubbles, by so much closer the texture; and by so much heavier the fluid: but that all bodies, whether fluid, or solid, (for solid bodies have, in their, most minute, particles little cavities fill'd with this rarified air) contain, within their bubbles, air more rarified than the ambient air, in which they are plac'd, must be affirm'd; for otherwise, (as will hereafter be made more plain) if the ambient air did not, with greater weight, or force, resist the spring of the air, contain'd in these bubbles, which wou'd, if the air were a lighter medium, have a continual endeavour to flow to it; the body, whether fluid, or solid, wou'd be divided, by the interposing of the particles of the air, into particles

particles as fine as the air it self. This is plain in the killing of quick-silver ; when the air (by straining of the quick-silver through leather, or otherwise) is suffer'd to insinuate it self between the particles of Mercury, those which remain seem in the form of *dust*, or *powder* ; and lose the connexion that there was between the particles of the whole body : nor can any of the, now remaining, visible parts, afford to its adjacent part (from which it is divided by a *septum of air*) any assistance, when it suffers by having its little bubbles more rarified, or *condens'd* : for as it is a visible particle , it must consist of bubbles ; since, even *invisible* ones, may consist of many thousands, and yet, all these join'd , not be sufficient to make one particle bigger than the particles of the air, in which we breathe ; so that even a particle of air may be suppos'd to consist of some thousands

Vid. Boyle of bubbles, or parts of its
Effluv. substance: and this won't
 seem strange when particles so small,
 and invisible, as those that are left on
 the ground, by a running hare, shall
 send from them, continually, so ma-
 ny, more minute as do affect the air
 some yards distance for several hours.
 But to return to our Mercury, we find
 the change that it has suffer'd, by be-
 ing kill'd, wholly proceeds from the in-
 tervention of air between its parts; there-
 fore each of those parts that remain,
 being the same that compos'd the
 whole fluid; (but only separated from
 the rest) is, it self, a fluid body; with
 no more difference, in property, or affe-
 ction, from that body, which was com-
 pos'd of the union of all its parts, than
 is observ'd betwixt a pint of the same
 fluid, and 100 Gallons: for each of
 those small particles, which are but just
 visible to the eye, are compos'd of an,
 almost, infinite number of small bub-
 bles,

bles, which are fill'd with a rarified air, by which the invisible particles are kept together, and made visible: and tho' the air shou'd continue to insinuate it self between, and divide, one of these, so small, *particles*, and again subdivide so long until it reduce it as small as its own *particles*, and, consequently, cause it to swim, and flow, with it, tho' this, I say, shou'd happen, yet might each of these aerial *particles* of Mercury be, with as much justness, term'd a *fluid body*, consisting of several *particles* in a continual motion within themselves.

This does, naturally, lead to the consideration of solid bodies; which seem, by this rule, to be nothing but an union of fluid *particles*; each of which *particles*, might, properly enough, be term'd a *fluid body*: several of these *particles*, or small *fluid bodies*, having each, its *parts* join'd, by the equal pressure of the external air (which being more condens'd than the *internal air*,

air, or that which fills its *bubbles*, forces each particle, as the rarified air within the bubbles is *purer*, or *grosser*, to a *closer*, or *opener texture*) and meeting, this will follow : either, 1st, that these *bubbles*, joining, make the *air between each bubble* (for in joining several little *spheres* together, there may be observ'd *irregular*, *triangular*, *Figures*, or a *space* which always is included, when three *circles* touch each other, between the three points of contact) equally rarified with the *air included in the bubbles* : and then the *surfaces* of the *bubbles*, meeting with no greater pressure from without, than they have *within*, will, easily, *break*, and *mix*, upon any occasion, the *internal air within the bubbles*, with the *external air included between the three points of contact of each bubble*; which *union* composes a *liquid body* : or, 2^{dly}, the *air*, contain'd between the three points of contact, will be more

more condens'd than the *air* in the *bubbles*; and more rarified than the external air: for, as I have intimated, the air that is included within the *surface* of any *body*, cannot be either *equally*, or *more*, condens'd than the ambient; and then the *bubbles* will keep themselves clos'd; and not communicate (without *violence*) the *air* in the *bubbles*, with the *air* between the three *points* of *contact*: this is what, vulgarly, is call'd a *solid*, or *firm*, *body*; which will be made more plain from the vulgar *experiment* usually made by boys, who, by joining a piece of wet *leather* to a *stone*, (but so that the *air* between the *stone*, and the *leather*, be more *rarified*, than the *ambient air*,) the *leather* shall, in a manner, seem, as if it grew to, or were one *part* of, the *stone*; so firmly does the equal *pressure* of the external *air* cement the two *bodies*, which, betwixt them, find a *space*, or *medium*, less inclinable to resist their *embraces*.

The

The same happens to the particles of a solid body ; which are to be represented by an infinite number of little spheres join'd ; betwixt every three of these little spheres, there will be a small triangular figure ; these figures will contain air in their cavities heavy enough to keep the little bubbles from breaking ; and yet rarified enough to keep (by attraction, or suction, if I may use those terms) three bubbles together clos'd, and join'd, at their points of contact, by the pressure of the ambient air (which cannot, because of the texture of its pores, insinuate it self, in so gross a particle, to these triangular figures, as it flows within its open Atmosphere,) all this will seem plain, to one who has been conversant with the Pneumatical Engine.

This also demonstrates the reason of liquefaction : for when a solid body (for instance, a ball of silver) meets with a violent fire, it must be thus opera-

operated on ; viz. the little triangular spaces, between the three points of contact, will, by the *intermission* of the particles of fire, and the drying up of the oily particles, be reduc'd to an equal degree of *rarification*, with the air contain'd within the *spheres* themselves, and consequently the *air*, within the *spheres*, meeting with no longer a resistance from the *pressure* of an heavier *Atmosphere*, (or what the *ancients* suppos'd to have been, a *suction*, or *attraction*) from within, *propter fugam vacui*, will break the *bubbles* that imprisoned them, and mix with the *air* in the triangular *figures*; and all the *air*, as well what is contain'd in the little *globes*, as what is between the three *points of contact*, being mix'd, and, consequently, of an equal *gravity*, no part of the *body*, in this *state*, is bounded by any other *force*, or *pres-sion*, than that of the *ambient air*; which is only contiguous to its outer *sur-face*;

face ; the pressure of the internal air, which fills the triangular spaces, being taken off : but, upon the sudden receding of the fiery particles, the fluid silver which continually forms it self into a successive number of bubbles, is surpris'd with an unequal motion ; for that rarified air, which in the egress of the fiery particles, was contain'd in small bubbles, does not meet with the same loss which the triangular spaces receive, by the departure of the fiery particles ; and consequently the air, being heavier in the triangular spaces, forces the bubbles to join, and keep, their places.

I conclude, therefore, that all bodies are liquid upon no other account than that the little bubbles, of which liquid bodies are compos'd, are (at least the greatest part of them) fill'd with an aerial substance ; of equal weight, and pressure, with the aerial matter, that is included in the triangular figures, be-

tween

tween the three points of contact, and as the liquid abounds in a greater, or less, degree, with bubbles, whose aerial matter within their cavities, is more rarified than the aerial matter, by whose community the liquid particles have a free intercourse from one another ; the liquid is more, or less, pure, or spiritual : for there is no liquor so pure, but that it does receive some let, or hindrance, in its motion, by several particles which flow in its body ; and cannot dissolve themselves into sociable forms, to afford the rest, of the fluid, share of their air ; and, in exchange, receive share of theirs : because the aerial matter within the bubbles of some of the particles (for each particle may consist of several bubbles as minuter particles) may be more rarified, than the aerial matter, of which the sociable particles that compose the liquid, is ; and consequently the lighter medium, within these forreign parti-

cles can't, by its own weight, or strength, force its way, through its own surface, which is press'd close by the greater weight of the sociable medium. By this means, Spirit of wine, (and all liquids, that, by the ingress of the particles of fire, have, as it were, an *Æquilibrium* made betwixt the aerial matter of all their bubbles) has its parts in the swiftest motion (or, at least, as swift a motion, as any, commonly known, liquid: for Mr. Boyle supposes Oleum Petracæ to be a liquid, specifically, lighter, and, consequently, having its parts in a swifter motion) of any containable fluid, that is, vulgarly, known; having the fewest foreign bubbles, that do consist of aerial matter more rarified than that which composes the unity betwixt the whole liquid.

Vid. Boyl's Mechanical Origine of Heat and Cold, p. 83.

Vid. Trans. Royal Society, vol. 1st. p. 620. where 'tis affirm'd that Ol. Petracæ is the lightest of all visible fluids.

Water (and all crude juices) consists of more

more of these foreign *bubbles* which hinder its *motion* from being so swift, and penetrable as *Spirit of wine*: *Balsomes*, *Syrups*, *Turpentine*, all other viscous *juices* meet with more of these foreign *particles*, as *obstacles to motion*, than *water*; *pitch*, and all other resinous bodies meet more *obstacles*, from foreign *bubbles*, than the viscous *juices*, and scarce keep any *community* with one anothers *parts*, even amongst those *parts* that are inclinable to be *sociable*, without *violence*, or having a *rariſcation* made in the whole by *fire*, to bring all the *parts* to a nearer *affinity* with the foreign: *lead*, *tin*, *silver*, *gold*, and all other malleable *metals* meet with so great an *opposition* from foreign *particles*, that they all consist of a great number of *particles* inclinable to be *sociable*; yet so many foreign *particles* intervene, that the *sociable particles* can have little, or no, *community* with one another, without the *help* of a *hammer*, or

fire, or other forceable instruments.

From this will appear, plainly, what is meant or to be understood by a body, term'd *malleable*; 'twill follow to consider, the reason of *brittleness* in *glass*, *temper'd Steel*, &c. If a body does consist of so many forreign *particles*, as do intercept, or cut off, all community betwixt the sociable *particles*, when any *violence* is us'd to this *body*, it must separate it self, and divide into *parts*: because, by the *violence* of the *hammer*, or other *instrument*, the *aerial matter*, within the triangular *figures*, included betwixt three *bubbles*, at their *points of contact*, is compress'd by the *flatning* of the *bubbles*, and by a sudden *dilating* (as may be observ'd in the *Springyness*, or *Elasticity*, of a *bow*, which has not the effect; unless when bent, it is suffer'd to regain its natural *state*, by a sudden *motion*: the same

same not happening if it come, leisurely, to that state) the other parts not being able to receive part of the compress'd aerial matter to ease those parts which, by its great compression, suffered, as it were, pain, being forc'd into an unnatural state, must certainly, by the elasticity of the aerial matter, endeavouring, very suddenly, to regain its former space, and restore the compress'd, and flatned, bubbles, to their natural, and globular, figure, be forc'd from the contiguity they had with the compress'd aerial matter ; and, consequently, suffer the ambient air to come between, and divide them.

Glass, Steel, and other metalline bodies, receive this disposition from the ingress of the foreign particles of fire, kept within their body, by the sudden cooling of the superficial parts ; which, by the Interposition of the parts of the body, they enter, lose the community they, otherwise, would have among themselves,

and likewise interpose, and hinder, the *community* there would, otherwise, be, betwixt the *particles of the body*, into which they have enter'd. This is further to be explain'd by the two next ensuing Sections.

S E C T. X

Of Elasticity.

*Vid. Boyle Susp.
of hidden qualities in
the air. p. 24.*

M R. Boyle, in his *Suspicious* about hidden qualities in the air, is at a great loss to find out what *soyt* of Substances those are in the air, which are, so absolutely, necessary to the subsisting of flame; suspecting (as he himself says) odd Substances either of Solar, or Astral, or of soime other exotic nature, on whose account the air is so necessary to the existing of flame.

Me.

Methinks so jealous a *Naturalist* might have had as great *matter* for *suspicion* from the *Springyness*, or *Elasticity*, in the *air*, which he has so often taken *notice* of, but never, as I know, attempted to find out, or, at least, has not demonstrated from what sort of *substances*, or *particles*, in the *air*, this, more strange, effect proceeds ; which he is apt enough to ascribe, as he does several other effects, to hidden *qualities*. If *Elasticity* be consider'd, according to what thoughts are here, already, deliver'd, in my *opinion* 'twill be no difficult *matter* to resolve the *doubt* in some *measure* ; the *air* has been consider'd as a *medium* compos'd of (as it were) a *Rendezvous* of the *particles* of all sorts of *bodies* ; the grosser of these *particles* are compos'd of several other *particles* join'd either with an *Æquilibrium* of aerial *matter*, and then composing (if so I may term it) a small liquid *body* ; or with an unequal

proportion of aerial matter (the aerial substance, between the points of contact, of the three bubbles, being heavier than the aerial matter in the bubbles) and then composing a small solid body, or part; either brittle, tensil, or malleable, according to the several dispositions before mention'd: the air therefore, consisting of infinite numbers of both sorts of those particles, indiscriminately, mix'd, (any weight, pressure, or force, that keeps these parts in an unnatural state, when this force is, suddenly, taken away, the body before compress'd, whose parts or bubbles were flatned) will, with as much swiftness, regain its natural state, as the force (that kept it an unnatural state,) is remov'd; as when a cork is depress'd, by a weight, under the surface of water, the weight being remov'd, that forc'd this cork to sink, it will, immediately, emerge.

The same happens to bows, and springs, whether of wood, or steel; ha-

ving

ving their *bubbles* flatned, and being of a temperament which will not suffer the compress'd aerial *matter* to, either get out of the *body*, or ease it self, by having communication with the rest of the aerial *matter*, within the *body*; the compress'd aerial *matter* flying, by a sudden motion, into its natural state, causes the observable effects, in all instruments of that nature; lead, and all metals, that yield, easily, to the hammer, if bent, have not the like effect; but remain in the state they are put into; without the least commotion, or resistance, in their parts. The reason is because, in lead there is a nearer affinity, of the particles, to those that compose liquid bodies; the particles of lead, tho' not having an absolute communication with one another, yet meet with less opposition from forreign particles.

The nature of *Elasticity*, may be better comprehended from the following Experiments.

A Bladder full, and hard, blown, if it be put into a receiver, and the air drawn out nimbly, the *spring*, or *elastick force*, of the internal air, will burst the *bladder*: if the *bladder* be put into the *receiver* very relax, or but half blown, the *Elasticity* of the *internal air* (the *external air* being exhausted) will force the *bladder* to swell, as if it had been full blown at first; and, upon the *admission* of the *air*, it will immediately, grow relax: and, notwithstanding a *medium* of *water* which may surround the *bladder* and seem to take off the *pressure* of the *air*, yet if a half blown, or relax, *bladder* be put under *water*, and, from the *surface* of the *water*, the *pressure* of the *Atmosphere* be remov'd, notwithstanding the *water*, I say, the *bladder* will swell, and occupy much more *space*, than it did before.

Vid. Boyle Physico Mechan. Exp. of the Spring. of the Air. p. 105.

These, and several other, Experiments, indicate that *Elasticity*,

Elasticity is nothing else but a jumping of bodies, confin'd, into a state of more ease, or a less degree of confinement.

S E C T. XI.

Of Sounds, and their propagation ; with an account of Echoes.

IT has been, and is, I suppose, taken for granted, by all *Philosophers*, that the motion the air is put into, and the effect that motion has on the *Tympanum*, or *drum*, of the *ear*, is the cause of sounds, and their perception ; but, to me, it has several times prov'd a matter of wonder, how the air, which will not be put into such a motion as to yield a sound, by several, very great, bodies, put into swift motion, should yet,

yet, by the slight *touch* of a *fiddle string*, or the *wire* of a *harp*, cause a *motion*, or *shivering*, in the *air*, sufficient to be perceiv'd some hundred yards round ; until, accidentally, casting into a smooth clear *water*, a single *pebble stone*, I could perceive the *surface* of the *water* to be annularly mov'd for several *yards* ; and by degrees, as the *circles* grew larger, and larger, they were less perceiveable , at last quite vanishing : yet, at the same time, large *fish*, which swam with a very quick *motion*, under the *surface* of the *water* did not at all *disturb* its *smoothness* : but, by several *experiments*, I found that if a *glass bubble* were broken, ever so low, beneath the *surface* of *water* it would make the same *commotion* on the *surface*, that the *pebble* had done.

This, with some other *experiments*, laid a *foundation* for the following *considerations* concerning *Sounds*, and *Echoes*.

'Tis

'Tis plain, that while a *fish* moves below the *surface* of the *water*, tho' e-
ver so quick, the *Æquilibrium* of the
water is not disturb'd; the *fish* occu-
pying no more *space*, during her *moti-
tion*, in one place, than she had done
in another, of the same *fluid*, which has
one common *surface*; (could she di-
late, or contact, her *body*, tho' be-
neath the *surface*, it would, very, much
disturb the *smoothness*, of the *surface*;
but the smallest *stone*, if thrown into
the *water*, causes a *separation*, in its
surface) and, consequently, a double
motion: one, which forces the *parts* of
water from the *space* which the *stone*
takes up when it, immediately, falls
on the *surface*, of the *water*; and a-
nother *motion*, caus'd by the flowing
back, or closing up, of that *space*, on
the *surface*, which the *stone*, in its
lower *descent*, forsakes.

The same reason offers in the pro-
duction of all *sounds*: for to produce a
sound,

found, 'tis necessary that there be caused a separation in the air : and, that in the very spot where the sound is, first, produc'd, there be such a vacuum as is suppos'd to be in receivers, when the air is exhausted, by the *Machina Pneumatica*, this gives a tremulous motion to the surface of the air (for in that separation it may be suppos'd, till the separation closes, to have an annular surface) which continues to extend its operation farther, as the first separation was greater or less: but the motion of a mans body in the air, or of any part of it, as his arm, &c. or the motion of any other body which does not meet another, tho' ever so quick, is only like the motion of a fish, swimming beneath the surface of the water, which gives no tremulous motion to the air; by causing great part of its body to be affected with a double motion; one, by the parts of air, which are forc'd from the vacuum, and disturb, and force

out

out of their *places*, the neighbouring *parts* of air; the other, by the receeding of those, or some other, *parts* of air into the, again clos'd, *vacuum*. 'Tis plain when any two *bodies* meet, and dash against each other, with *violence*, as the two *bodies* are a greater, or less, *degree* from *liquidity*, the *sound* made, by their *meeting*, will be continued, or shortned: and that *some sound* must be produc'd by two *bodies* meeting, will be evident from the *separation* their meeting will cause in those *points*, where the two *bodies* touch each other.

How the *continuation* of a *sound* is preserv'd by the *disposition* of both, or either of the *bodies* so meeting, as the *sound* of a *bell*, a *glass*, &c. it may not seem impertinent to consider.

Fluids receive a perceptible *motion* upon no other account than that part of the *surface*, of one *fluid*, encroaches upon the *borders* of its neighbouring *fluid*:

id : For example ; a *fish*, tho' swimming in the *water*, causes no disturbance in that *element* ; yet could this *fish* swell, and occupy more *space*, than it did before, the *surface* of the *water* (nay the whole *body* of *water* in general) would receive a *curling motion*, from those *parts* of *water* which were, before, in the *space* that the swell'd *fish* takes up, which flow through the whole *body* of the *water* to make an *Æquilibrium*: and because the *water* can find no *room* for these *parts* to be contain'd within the *space* it occupied before, the whole *body* of *water* is forc'd to be put to the trouble of removing out of its *place*, to make *room* for these *intruders*, by encroaching on the *air*, until it has gain'd as much *space* from the *air*, as the *fish*, by swelling, depriv'd it of. Thus, when a *bell* is struck, in any *part*, the small *bubbles* (of which the *bell* is compos'd, which I have intimated to be, every one

one

one of them, fluid bodies) upon the place where the bell is struck, by the separation of the air, flow in upon the vacuum, where they find a less pressure, than their neighbouring bubbles receive from the ambient air, (which keeps the parts, of all solid bodies, in their place,) and, by thus quitting some of their places, their neighbouring bubbles (or, at least, the aerial matter that surrounds them, included betwixt the three points of contact) assume the space that they quitted ; so that the struck bubbles finding themselves forc'd back, by the closing of the vacuum, force also their neighbours back again to their places ; which, like a pendulum once put in motion, move, almost, as far back out of their place of rest, as as they were forc'd forward ; until, by degrees, wavering less and less, they obtain, each, their proper places of rest. This motion is not in bodies that are liquid ; and by how much nearer affinity,

the body has to liquidity, by so much less does it partake of this ringing quality; because, in liquid bodies, there is a communication between the bubbles of the whole body; and they have all but one common surface: whereas the wavering motion, which causes our perception, is propagated by the encroaching of the surface of one medium, upon that of a differing medium, whose specifick gravity must be different; all brittle bodies are compos'd of bubbles which have small Atmospheres, of aerial matter, of a very differing specifick gravity; this happens by the admission of so many foreign particles, betwixt its bubbles, and which consequently, have their parts separated by abundance of differing surfaces.

It may be objected that I seem to agree, as if bodies were no otherwise to be reckon'd solid, than that they have a number of fluid bubbles, press'd together, by the equal pressure of the Atmosphere:

or,

or, what will be the same, that these bubbles are suck'd together by a lighter medium, propter fugam vacui, but this is demonstrated by experiments; rather the contrary appears: for in an evacuated receiver, tho' ever so well free'd from the pressure of the ambient air, the included body remains entire; which could not be if no other cause chain'd its parts together than the pressure of the Atmosphere: I answer, that the vacuum Boyleanum, can, strictly so speaking, be no more reckoned a vacuum, than a bottle close stopt, and full of air, when under water (because the water is excluded from entring its cavity) ought to be accounted void of all Substance: for the Æther (if I may so term what is left included in Vacuo Boyleano when the air is excluded) that encompasses a body enclos'd in the Pneumatick Engine, bears a very great disparity, in specifick gravity, from that, more subtil, Æthereial, matter, that is included within

the bubbles of the body ; therefore, tho' it suffers the body to swell, yet this space, or vacuum Boyleanum, retains pressure e-nough to resist any effort that the included *Ætherial, or Aerial matter* (what ever it may be call'd) within the bubbles, may have to get out ; which force, because of the extream *Spiritu-ousness* of it, can be little, or, in some of the bubbles, (for I have intimated a difference) scarce any at all.

The nature of *SOUNDS*, by this time, seems to me pretty well hinted at. But why sounds should reverberate, and return to the same place, from whence they were, first, sent, and at some distance of time after their departure, remains to be consider'd. It is observ'd that if wire, cat's gut, &c. are not plac'd upon some hollow bodies, which have their internal cavities fill'd with air, whose surface is separated, in every part, from the common air, except at some few holes where the external air has a communication

communication with the *internal*; the sound made by the trembling of those tinsel bodies, when slenderly, touch'd, is very little, or scarce, *peceiveable*: the reason of which, I find most easy to be comprehended, when *air* is consider'd with the *analogy* it bears to *water*: I have often taken notice that *water*, when put into *motion*, by the *wind*, and raising it self, above its common *surface*, into *waves*; when one, or more, of these *waves*, is dash'd against a *wall*, which is a *bound*, that, as it were, confines, and hems in, the *water*, upon the reverberation of this *wave* there is a hollow *cavity*, or *vacuum*, left, by the *waves* receeding as far below the common *surface* of the *water*, as it had swell'd above; which *cavity* against the *wall* (by the rule of *Hydrostaticks*) must cause another *motion* in the *water* which flows to make an *Æquilibrium*, or an equal *surface*; this may be offer'd as a reason why, near rocks in the *Sea*,

gainst which the waves dash, there is always observ'd a greater course of waves than in any other place, at a greater *distance* from them. To apply this observation to our present purpose, 'twill be pertinent to take notice of the sound made with a *drum* struck by a *drummer*; the struck *parchment* being extended, almost, as far *nature*, without tearing, will permit, by the force of the *blow*, has its *surface* thrust inwards; which, with as much *quickness*, jumps outwards, by the *Elasticity* it receives from its *parts*, that are forc'd into an unnatural *state*; in the extraordinary *extension* by these two *motions*, the internal *air* is reverberated backwards, and forwards, against the opposite *head*, or *parchment*, of the *drum* (which is also *elastick*:) in these several *reverberations* (as in the reverberating of the *wave* against the *wall*) there are several *vacuums* left, which to be fill'd, and an *Æquilibrium* to be made, requires

requires the assistance of the *external air*, with which the *internal* keeps constant correspondence, by small holes in the side of the *drum*. Almost the same reason offers in all *strung instruments*: for the *external air*, receiving a curling motion, by the trembling of the *string*, communicates this motion to the *internal air*: which *motion*, not being lost, when it comes to the confines of the *instrument*, and being, there, stopt in proceeding, regularly, forward, as the *motion* given to the *external air* did, 'tis reverberated backwards, and forwards; in every one of which *reverberations* the *external air* receives a particular *affection*, by being oblig'd (because of its correspondence with it) to assist, and help out, the *internal air* in any of its affections; so that when, by the *reverberation* of the *internal air*, any small *vacuumis* are caus'd at the side of the *instrument*, (as in the parallel, the *water* dashing against the *wall*) the *external air* must receive

to it self the *superfluities* of the *internal air*, to hinder a compression of air within the *instrument*, which would, otherwise, happen ; and upon the closing of these *vacuums*, the *external air* must refund as much as it receiv'd from the *internal* ; and this will happen as long as there remains any *trembling* in the *strings*, or any *reverberities* in the *instrument* : if it be examin'd how the *trembling* of the *strings*, causes a *sound*, (whereas no *sound* can be propagated, as has been intimated, without a *separation* of a *surface* of the *air*, but the *trembling* of a *string* is not sufficient to cause a *separation* in the *air*) it may be answer'd, that whatever *touch* causes that *trembling* in *strings*, in that very *spot* is the *sound* begun ; because, in that *spot*, the *bubbles* that compose that part of the *string* that receives the *touch*, are set, a little, at *liberty*, from the unnatural *state* that they are plac'd in by their extream *extension* ; and consequently

quently jump forwards ; at which motion all the bubbles, of which the string is compos'd, successively succeed that jump, and are all as quickly forc'd back again into their places by the sudden closing of the first separation ; however, as the first separation was surprizing, so is the close which forces them in a state more unnatural than the extension of the string, and the ambient air may allow ; and consequently (as unto a vibratious pendulum) successive wavering happen betwixt the bubbles, encroaching on the surface of the ambient air, and the ambient air on the surface of the bubbles, less, and less ; until, by degrees, both receive a natural state.

This explanation of sounds leads, directly, to the solution of one very notable Phænomenon in nature, viz. that of Echoes : which are nothing but the reflection of the motion the air is put into by the walls of hollow vaults, or caverns ;

vers, thus happening, the motion given unto the whole body of the air in general, is communicated to every particular portion of air; which, at some parts of its surface, is bounded from the common Atmosphere; these bounds hinder the wavering motion, which is communicated to the bounded air, from proceeding along with the rest of the circles which move with all the bounds; and, consequently, the internal air is in greater motion than the external; because it stops some of the motion, and retains it to it self, that which the external should have receiv'd; and, of necessity, this greater motion, in the internal air, must cause another, in the external; which as it is farther, or nearer, to the place from whence the sound was, first, sent; so it will, more slowly, or suddainly, return.

S E C T. XII.

Of Light and Colours.

I Must own I am not fond of commending Mr. Hob^s: and yet, in this, I am forc'd to acknowledge, he comes the nearest my *mind* of any Philosopher I have met with; and in a great many other things, in my opinion, argues very subtilly, tho' in the *main* he proceeds upon a wrong foundation.

Tho' I design to consider the Soul with all its *operations*, and *affections*, in a particular chapter; yet it seems necessary, for the better understanding this, and the preceeding section, to consider, a little, how the Soul must, unavoidably, be affected (the *organs* of the *body* not being vitiated) by any motion in the ambient *air*: the *ear* is made with a thin, opace *membrane* which very,

very easily, by the *impulse* it meets with from the wavering motion, in the ambient *air*, is forc'd inwards; and, consequently, forces the whole animal *Soul*, which possesses every *place*, or *space*, within the *organick form*, into a contracted state; which, by a reflected, or elastic, *motion*, against the membranes of the *ear*, (no other bounds of the *human body* suffering themselves to be intruded, or extruded, by so slight a *motion*) suffers the animal *Soul* to be, almost, as much dilated, as, before, it was contracted; which wavering in the animal *Soul*, successively, continues longer, or shorter, according to the first *impulse*, or separation, in the *air*, which is the cause of the wavering *motion*, not only in the ambient *air*, but also in the animal *Soul*: the membrane of the *ear* being opace, no other *motion*, in the *air* (the *air* being several ways, mov'd within it self, without having its substance contracted, or dilated) can affect

it ; but such a one as causes an impulse by the contracting, and dilating the whole body of the ambient air : which, by its elastick force, strikes on the whole body ; but finds no part that yields to its stroak, except the thin membrane of the ear.

But we have suppos'd another notable motion, in all fluid bodies, caus'd by the continual breaking of their bubbles, and a rarifaction, in some parts ; consequently the remoter, as well as the nearer, parts of the air (it being a fluid) are affected, or mov'd, by the rarifaction, and break their bubbles, and move towards the rarifaction to cause an *Æquilibrium* : in this motion the parts suffer little, or no contracting, or dilating, (except in the place where the rarifaction is ; which, if very great, and quick, causes sound, as in the burning of thorns,) and therefore use no impulse against any body they meet.

The human Soul, being the principle
of

of motion within the *microcosm*, of human body, and design'd, by the creator to participate of every universal motion of the *macrocosm* in which it is plac'd, might, justly, think it self very much wrong'd if it had no organ, or membrane, by which it might receive intelligence what motions were actually operating on it; for, in any rarification, when the bubbles of the air are broke, and flow towards any body to make an *Aequilibrium*, the bubbles also of that body, at least as many of them as are contiguous to the air, must break themselves; and, when this is done very quick, and the continuation long, so as to set the whole frame of the body in a more than ordinary state of motion, the perception of it is called heat, which affects any, or every, part of the body: but the organs of the body being so fram'd as to receive continual alterations in their motion not only from external, but also from internal, causes, (each passion

passion causing a disturbance, or commotion, in the blood) small alterations in the ambient air, would pass unperceiv'd, did not *nature* provide a transparent, pervious, *organ*, to suffer the *Soul* to be, more immediately, affected with the motion the air receives from a *rari-faction* in any part.

This *Organ* (viz. the *eye*) suffers the thin and subtil *medium*, which fill'd the bubbles of the ambient air, to have *communication* with the animal *Soul*; which is a *substance* for *subtileness*, and *spirituousness*, of nearest *affinity* to the *Soul*, or *life*, of all living *Creatures*: and, consequently, the *Soul* of every living *Creature* is affected with a *Sympathy*, towards its own *likeness*, tho', because of the *interposition* of *matter*, it can neither comprehend the *form*, or *nature*, of this subtil ætherial *substance*; much less is it able to investigate its own *form*, or *essence*; but by the means of the ætherial *medium*, all gross *forms* of light

grosser matter are perceiv'd: yet, by the interposition of these material forms, the ætherial medium (which I would term light) receives a peculiar reflection, or disposition; (which I design to term light) and the Soul, receiving this light with the irregular reflection, or disposition, it has receiv'd from the intervening matter, must form some notion, or conception, of the body, or shadow, which causes this affection in the light it receives.

That the Soul must, of necessity, receive a motion from the breaking of the bubbles in the air, may be concluded if it be granted that the Soul is a fluid, or, at least, is contained in a fluid vehicle, as I suppose it to be: to explain this we may consider how the air is affected by the flame of a Lamp, or candle; in the space, which the flame occupies, there is a less pressure than what is made by the ambient air (the oleagenous particles of matter, of which

the flame is compos'd, being lighter than (the aqueous) and consequently, the bubbles which are, immediately, contiguous to the flame, not receiving so great a pressure from the flame, as they receive from the ambient air, must break, and be dissolved, and leave room for those bubbles which they, immediately, bound, and kept in their places, to succeed their dissolution ; and be dissolved also : these two ranks of bubbles, being absorb'd by the flame, the third and fourth advance ; and, after them, their followers, 'till, in a trice, the whole body of the air is put, as it were, in a march towards the flame, the air, moving thus forwards, all bodies which have their parts joined, in a solid form, by the pressure of the air, must also have (at least in some of the bubbles of which they are compos'd) an endeavour to move forwards, and succeed the motion of the air towards the flame ; and, in this endeavour, the parts of the

solid body, are more tumid, and if the flame be violent, and occupy great space, and the body near to it, the bubbles of the Body are, actually, disposed, and sent off in great plenty ; the ambient air being made too light any longer to keep all the parts together : which by its greater pressure, it, before, bound, in one mass, in animals : if this rarification of the air be so great as to cause, in the Soul, a perception from any part of the body, it is call'd heat ; if it be so moderate as to cause in the Soul a perception from the eye only, 'tis call'd light ; which light were it to be defin'd, is only a continual dissolving, fluidity, or motion, in the vehicle of the animal Soul caus'd by its actually moving after the departing bubbles of the air towards some place of rarification, and if any body intervenes in this forward motion of the Vehicle of the Soul, which reflects this forward motion back again to it self, according to the disposition of the parts of the

the body, that thus reflects these particles, that emanate from the animal, the *Image* or *Impression* is delivered back to the Soul with some peculiar shade, which causes, in the Soul, a differing apprehension, from what it receives, merely from the progression of its parts ; and gives it first an *Idea* of the dimension of the body, that is interpos'd betwixt it, and the progression of its particles, or Spirits, that are sent from it ; and secondly the degrees of difference between the reflection, the body causes, and the perception, it would have receiv'd, had not the body been interpos'd ; and this is term'd colours : which are only degrees of difference betwixt a perfect shade, or darkness ; and no shade, or light.

If the body be very *Diaphanous*, as pure transparent clear glass, it cannot properly be term'd of any colour ; because it suffers those parts, or spirits, which are sent, from the animal Soul, to pass with, scarce any, reflection : if

the bubbles, that compose the superficies of a body, be fill'd with a very subtil ætherial Substance, of a much thinner nature than the ambient air, the reflection carries back, to the Soul, part of the image of the ætherial matter, which fill'd the bubbles, by which it was reflected; and the resemblance of this subtil, ætherial matter (this being of nearer affinity with those Spirits, that were sent from the animal Soul) is term'd white, as being a reflection, which, the least, shades, or alters, the image of the light, it self.

This solution of colours, may seem the more plausible to some people by its having so ingenious an Author as Gassendus to back it.

Vid. Gassend. Epist. 2.

De Apparente Magnitudine. p. 45,

“ Ad hæc (says he,
“ having reference to
“ what goes before)
“ Spumam ex aqua pu-
“ ra, non alia ratione videri candescere,
“ & albescere, quam quod sit con-
“ geries

" geries confertissima minutissimarum
 " bullarum, quarum unaquæque su-
 " um radium reflectit; unde conti-
 " nens candor, alborve, apparet. Denique,
 " nivem nihil aliud videri quam spe-
 " ciem purissimæ spumæ, ex bullulis quam
 " minutissimis, & confertissimis co-
 " cohærentis: "but, what immediately
 follows, methinks, ought not to be
 omitted; as suiting very well in
 this place; "sed ridiculum me exhibeam,
 " si tales meas nugas uberius proponem.

'Twould be very easy to enlarge on
 this Subject; to consider what colours
 may be produc'd from mixtures, and
 what sort of substance the superficial
 bubbles of black bodies are fill'd with;
 but more particularly, the philosophi-
 cal Proverb, *adusta alba, sed perusta*
nigra, seems, here, to require our thoughts;
 also what quality it is
 in black bodies that dis- *Vid. Boyle of Col-*
 poses them to heat *ours. p. 126,*
 sooner, and in a great-

er quantity, than white bodies, might deserve notice : but these, considering

with how much ease I find them to be solv'd, according to what thoughts are, already, delivered,

An experiment with a tile half white and half black, expos'd to the Sun; the white part of the tile remained cool whilst the black part of it was grown very hot.

I think, would prove trifles ; and detain me, too long, from more material thoughts to be delivered in the following chapter.

C H A P. III,

*Of the Operation of Spirit on
Body, or of Animation in
general.*

S E C T. I.

*Of the three sorts of Chemical Spirits, viz.
vinous, acid, and urinous or ani-
mal: with the Analogy they bear
to the Spirit, Soul, or Life of all
bodies.*

Chimists usually call those liquors,
which they extract from bodies,
by the help of fire, *Spirits*; whether
from the notableness of their effect, or
that they suppose them to bear some
resemblance to the *flamma vitalis* of ani-
mals, is not material, every one fra-
ming this apprehension of them, *viz.*

G 4 that

that they are *liquors*, whose parts are in a swifter motion than any other fluid, that, less, merits the name of *Spirit*.

Of these kind of *Spirits* there are three sorts: the first is extracted from *bodies*, which by unloosing, or breaking, their *bubbles* (this is often termed *fermentation*) suffer the *oleagenous particles* to free themselves, in some measure, from the *aqueous*, and have *commerce* amongst themselves, and pass through the *aqueous* without adhering to them.

Bodies, in this state, when the *particles* of fire are admitted, through the *pores* of glass or other vessels, suffer the fire which is, it self, entirely, compos'd of the *oleagenous parts* of matter, to lay hold on the *oleagenous parts* of the body that it passes through, and, in its mounting, meeting with the ambient air, it receives so many *aqueous*, or *refrigerating particles* from it, as do

do make the ascending *Spirit*, a few degrees heavier than the *air*, and consequently give it weight enough to sink, and form it self into a visible *fluid*; for any body that is, the least degree, grosser than the *air*, is visible; and, upon that account only, is *containable*, or may be kept for the use of *man*; for all things, lighter than *air*, are too nimble for us; and fly away whilst we endeavour to catch them. This first kind of *Spirit* is call'd *VINOUS*: and being compos'd, for the most part, of the *oleagenous parts* of matter, is inflammable.

The second sort of *Spirit*, is extract'd from all undigested bodies, of the vegetative, or mineral, kingdom, by the means of fire; whose particles entring between the particles of the crude *body*, catch hold of the aqueous, and *oleagenous parts* of the *body*, mixt as they are, without severing either from the other; and when the *liquor* falls

falls down congeal'd, into the *Recipient*; the *Spirit* is term'd *ACID*: and is, altogether, uninflammable.

The third sort of *Spirit*, term'd *URINOUS*, is extracted out of the bodies of *animals*; where, by the vital heat of the *animal*, the oily parts are, so perfectly, mixed with the *watry*, that no fermentation can separate their firm union; tho' fermentation causes *animal bodies*, sooner to yield their *Spirit*; for if crude, undigested, *animal bodies* be placed, over the fire, they, for a long time, send from them a stinking *phlegm*, before any *Spirit* can be forc'd over. This *Spirit*, by the entire mixture of *watry parts* with the *oily*, becomes not inflammable.

Mr. Boyle makes mention of a fourth sort of *Spirit*, which he styles *anonymous*, or *neutral*, caus'd by the union of an *urinous*, and *acid*, *Spirit*. But he might, as well, have introduc'd a fifth from the union of a *vinous*, and

an urinous, Spirit : (as *Sal Volatile Oleosum.*) Or a sixth, by uniting a vinosus, and an acid : these three last, being compounded with one of the other two, ought not to be reckoned in the *cardinal number* ; there being properly, in nature, only three sorts of *Spirits*, which, simply, differ from each other.

These three sorts of *Spirits*, the specifick gravity of each being greater than that of *air*, may, notwithstanding assist us in the enquiring after *substances*, or *Spirits* more subtile, or of less specifick gravity, than *air*.

In the former chapter it has been attempted to be proved that no *body* can, properly, be termed *solid*, tho' of ever so close a texture, and free from *pores* ; all bodies having some minute, ætherial *substance* much lighter than *air*, that has a general correspondence with whatsoever aerial, or ætherial *substance* may fill the *cavities* of the rest of the

the bubbles ; tho' at the same time, these bubbles are fill'd with something, specifically lighter than air ; so that some subtle fluid has always a continual motion within the bounds of every body ; and as the body is of a more loose, or open, texture, this fluid is more gross, in some parts ; but always reserves secret pores, wherein none, but the most spirituous parts, are admitted to enter : and that body, whatsoever it is, that has pores, which admit of particles into some of its parts, or receptacles, finer than any that are admitted into another ; that body which produces (by its own separation) the highest rectified Spirits is, by so much the more noble, as its Spirits, that it reserves, and separates from its grosser parts, are finer than what are separated (tho' from the same sort of substances) by another, or other bodies.

Stones, metals, minerals, &c. which we reckon inanimate substances (tho' I

am

am not, altogether, for depriving them of *life*, or *spirit*) are bodies which do consist of *parts*, or *pores*, almost all alike, and have not any considerable *store* of secret *reserves* of *spirits*, much more subtile than the common *stock*.

Vegetables, which are accounted the lowest degree of animate *creatures*, have a, very discernable, *difference* in their *pores*, or *fibres*, which may be discern'd by the naked eye, in a *leaf* of any *tree*, or *plant*; wherein may be observ'd protuberant *nerves* swelling, largely, above the *surface* of the smaller *textures* of the *leaf*: and, by good *glasses*, may be observ'd in those *parts* of the *leaf* where the *texture* is the closest, and no *fibres* to be discern'd by the naked eye, a wonderful complication of small *fibres*; so that the whole *leaf*, not only seems, but may, rationally enough, be suppos'd to be nothing but a *texture*, of *fibres*, which, by the wonderful *minuteness* of some, scarce visible,

or

or even invisible, tubes, and filaments, are woven into that close, and curious frame: through every one of these tubes, or canals, according to the Diameter of its pores, is strain'd a juice of finer, or grosser, substance from the root of the tree, plant, or shrub; through the trunk, is strain'd a thick gummy juice: this juice leaves, in the trunk, some of its grosser parts, and carries a thinner liquor to the finer branches; the leaves, through their finer tubes, can't admit of their juice, which they receive from the branches so gross, as what was admitted by the branches from the trunk; but through every one of the smallest, and even invisible, fibres of its texture suffer a fluid liquor to pass; which, in some of the filaments it passes through, is resolv'd finer than the particles of air: the succession of matter, from the root, forces what is already prepar'd forwards, and the matter that is of a less specifick gravity, than air, into whatsoever

soever place it is forc'd, will, in that place, frame itself an *organ*, *fibre*, *case*, or *tube*, to flow in ; because the ambient, and internal, *air* are both heavier than this spiritual prepar'd *matter*, and must, of necessity, force, and press, the adjacent *matter*, as close to it as its *particles* will permit (or as the *ancients* have held, the spiritual, or more minute *matter* will attract the adjacent matter *propter fugam vacui*) and thus the spiritual *matter* frames *filaments* in each place of its *progression*. The course that this spiritual *matter* takes is plain : it first adds *filaments*, or *fibres*, to the *leaf*, in which it is fram'd, and, from that, is forc'd back, to the *branch*, to which it adds *filaments* having *pores* exactly fitted to the *dimension* of its *parts*, and from the *branch*, through the *trunk*, is forc'd back again to the *root* ; where it attracts *matter*, or frames *fibres*, out of the *particles* of the *earth* ; for these *particles* must, of necessity, be forc'd towards

towards the spiritual substance; and these whole fibres, or filaments, rubbing themselves up together, frame a juicy substance, which, by the departure of the preceeding juice, that fill'd the cavity of the tube, by which it is to ascend, (this, according to the doctrine of Hydrostaticks, ought to be accounted for from the pressure of the Atmosphere; because in the deserted tubes there may be suppos'd to be left a thinner medium than air) mounts the trunk of the tree, &c, by large tubes, or pores; and thus proceeds in its circulatory motion; so that even the juice, which mounts the tree, were it to be dissected, would prove only a complication of invisible tubes, and fibres, which have been before form'd in the leaves, or fruit, of the tree, and even that juice has, flowing within it, a thinner, ætherial juice; which does not quit its place till the whole frame of the body be destroy'd; therefore when any of these vegetables are

are destill'd, they yield first their *phlegm*; and when the ætherial substance, within these smallest tubes, is forc'd to quit its place, it only disposes the remaining watry parts into small fibres, or *filaments* (into which it insinuates it self, which altogether prove but a little heavier than *air*) and, with its vehicle of watry matter, falls into the *Recipient* in the form of what we call an acid *Spirit*.

If the juice of vegetables (which is only a complication of fibres so join'd that any of them may, by the least motion, be broken, and yet, at the same instant, new fibres created, by the power of the ætherial matter that fills them) be expos'd where the ætherial matter within its fibres, can receive no fresh supplies of matter to form new fibres to lodge it self in (for the old fibres, at any time, expos'd to the assaults of the air; soon become unfit to contain so subtile a matter) by

H wearing

wearing out its fibres it suffers, from all parts of the juice, such particles, to flow in upon it as are fit to mix, and incorporate with it, which (it being compos'd of the oleagenous, *parts* of matter, because thofe *parts* are the only *particles* of matter that fuffer themselves to be divided into *particles* less than air) can be only the oleagenous *parts* of the juice ; the watry *parts*, bearing an antipathy to the oyly, cannot be made to join, or incorporate, with them ; when the juice, in this fermented state, is de-still'd, it affords, immediately, a vi-nous *Spirit*.

SECT

S E C T. II.

*Of the Seminal, or prolifick
Quality of bodies inspir'd
either with a sensitive, ve-
getative, or rational Soul.*

Wheresoever the aerial, or spiritual substance, with which all bodies that have life, are inspir'd, is prepar'd; nature, in that place, and instant, provides it an organ containing vessel, or pipe, by forcing the adjacent, and grosser matter to close on it, yet leaves a cavity, or pores, for it to circulate in. And, because all matter is not prepar'd fit to be a case to the subtle particles of spirit (for gross bodies whose particles have not been refin'd are too porous, nor can their particles be join'd so close but that the spiritual particles

will slip through) there is also provided an inferior rank of spiritual particles which, in *minuteness*, differ, but a degree, from the former, to close upon the more *spiritual*; these are encas'd within particles a degree grosser than the former; and these last again are embrac'd by *coffins* of matter, of several degrees, which cause the outermost *superficies*, still to consist of grosser particles than any that it covers. So that, tho' several of the inferior coats may be wholly invisible, as being more minute than the ambient air, yet the exterior may become very *conspicuous*.

According to the size, disposition, and several other qualities of the finest, or purest, spirit of any living creature, there is ordained a suitable sublervient rank of particles, gradually encreasing in *magnitude*, to attend each, even the minutest, portion of this Spirit: and assist it to draw more, and grosser, particles, to it self; to encrease its body, and

and give it the *form*, and *figure*, it obtains it self.

It's suppos'd that every *portion* of *spirit*, has a *shape* or *form*: but this *shape* cannot be seen in *spirit*, because it is a thing consisting of *parts*, more minute than the *medium* in which every thing is perceiv'd: and this *shape*, or *form*, is given to it by joining to it subservient *degrees* of grosser *spirits*: for the first *spirit* or the *Deity* is not to be apprehended by *form*.

The spirituous *parts* of a *plant* compose (tho' unperceiveable) one whole true, and perfect, *form* of the *plant*; exhibiting all the *fibres* that afterwards are made *manifest* in the grown *plant*; yet, even when largely grown, there remain some intermediate *fibres* in its *texture* which are, scarcely, visible.

This *spiritual form*, is enclos'd in some *portion* of the common *texture* of the whole *plant*; and termed *seed*: which *seed* consisting of every *bough*,

branch, vein, and fibre, that is perceiveable in the grown plant, in absolute form, each of these parts of the plant draws (to keep and better contain the spiritual matter that is within these, tho' minute branches) and arms them from being injur'd by the external air acting too harsh on its tender tegument and grosser particles to its exterior surface : every fibre, proportionably increasing with the whole : at first, only a just visible, resemblance of the parts is produc'd, which are, in time, extended to their due proportion.

From a parallel reason it may be concluded that the soul of a sensitive animal, and every portion of it, contains the true, and perfect, form of the animal, that is inspired by it ; perhaps it may be argued that the soul is held indiscerpable ; this I grant, in the rational soul, may hold true, but if indiscerpability be attributed to the animal soul, how shall we account for the parts
of

of earth-worms, eels, and several other animals, moving after they are separated one, from the other, and yet when they were all joined they had but one common soul, or principle of life, and motion.

If then the soul, of a sensitive animal, bears the exact form of the animal, and this form only proves invisible from its being a thinner substance than the medium of vision; the least portion of this soul, conveyed into a convenient receptacle, where it may receive heat, and sufficient nourishment, or particles of fit, adapted, matter, to join to it, will, thereby, encrease it self, and grow stronger by attracting more matter to strengthen its case, or vehicle.

I am sensible this thought may be subject to ridicule; for, says one, a pretty conceit! the Soul, as suppose of a dog; must altogether, be thought to have the form of a dog; and yet, at the same time, every, even the min-

test, particle of that which in the whole, is but a part and may, perhaps, only be a particle that conduces to make up a leg, or a claw of this invisible form, must be thought to have, it self, head, legs, tail, body, &c.

To this I answer ; that spirit, as it is purely spirit, has no form at all ; but when we talk of it with form, we only represent, to the mind, the figure which is made by the septum, or vehicle, that bounds it from the medium of air ; or what other medium surrounds it : as a field covered all with grass, and plain, can be said to have no other differing form from another field, whose surface is, equally, green, and level with it ; than the figure, or shape, of the wall, or hedge, that surrounds it : nor does one drop of water differ any otherwise from the whole quantity, or bottle, from which it was dropt, than that it is bounded with something of a differing shape from the shape the

whole

whole received by the *vessel* in which it was kept.

To make the case plainer. Suppose in *water* a *quality*, or *power* (as it seems in *drops* to have, each falling in a *spherical figure*) to be contained in no other *vessel*, or *vehicle*, than what is exactly *round*; and this *water*, when poured out of a *round vessel*, should have *power* to force the other *vessel* it is poured into, tho' of a differing *figure*, into a *shape* fit to contain it, which is to be no other *form* than *round*: to make this applicable to the *Soul*, 'tis very just to believe the *Soul* has a *power* to force its *vehicle* into such a *form* as it is disposed to be contained in, and tho' *part* of it, before *separation* was content with the *form*, which the whole was contained in; yet by *separation*, it must, it self, seek a new *vehicle*, or *case*, to keep it self in; and since this *case* must have some *form*, what *form* may be supos'd more proper to give the

the case, than the form, it was before so well us'd and endur'd to ?

From these thoughts it will be no hard matter to conceive how the *seeds* of all *bodies*, that have *life*, enjoy the *form* of the *plant*, or *animal*, from which they were sent ; the *plant* affords its *seed* when in its *bloom*, it grows *luxuriant* ; and the *life*, or *soul*, or *spirit*, of it, within, waxes *exuberant* ; the *animal* swell'd with *life*, or *spirit*, feels a more pleasing *sensation*, than ordinary ; and in its full and perfect *vigour*, urg'd by the *embraces* of a *female consort*, forces *seminal*, or *inspir'd*, matter from it to make more *room* for the *exultations*, that the *soul* receives, by the *desire* of *copulation*, both the *animal*, and like-wise the *vegetative*, *seed*, may well be thought to enjoy, *part* of the *soul* of the *plant*, or *animal*, from which it flow'd ; and this part of the *soul* may be, reasonably enough, believed, immediately to give to the *vehicle*, that contains

contains it, the form the whole soul, or spirit has bestowed on its case, or vehicle.

S E C T. III.

*The Soul of Brutes consider'd
as it is the cause of sensa-
tion.*

THE Soul that inspires vegetables, receives so great an alloy from matter, and it moves so slow that it suffers, a far more durable covering to be drawn about it, than what surrounds animals; by this means (the texture of its covering being very solid, close, and compact) it does not suffer half the expence, of spirit by insensible perspiration, as the bodies of animal do; neither is there so great a necessity in vegetables, of constant, and profuse, supplies

Supplies of matter (to make up their daily loss) as animals require; besides the supplies that animals have from matter they receive by suffering the matter gross, as it is, to enter their bodies; and there to be dissolved, and made fit for their nourishment, out of which it chuses proper parts; and rejects, and sends off as excrementitious such as are disagreeable to the animal soul.

But vegetables are of so entire a texture, that they admit of nothing within their body but such prepared, and refin'd, particles, as nature, by the heat of the Sun, adapts for them out of the earth; that is, immediately, adjacent to their roots.

In vegetables, the ætherial substance which inspires the whole plant with life, has not a free Communication, but by the interposition of its vehicle, is divided, as it were, into parts; so that when one part suffers by being tore or seperated, the others receive no disturbance, or Sensation; the contrary happens to animals

anamals whose Soul, or Spirit, has an absolute Communication, each part, with the *whole*; which must, of necessity, cause *motion*, and *sensation*; *motion*, as if a *bladder* blown with *air*, and sunk to the *bottom* of *water*, by a suspended *weight*, if this *air* coud contract, and dilate, its *body* tho it cou'd not make the *weight* rise, but very little, from its *place* yet it woud move it self round the *space* it is confined to: and if the *string*, that tyes it to the *weight*, be lengthened, the elasticity of the internal *air*, moving, would force the *bladder* to move to the extent of the *string*, that confines it; this is the very *cause* of *motion* in *animals*, whose *bodys* are *cases*, or *vehicles*, that contain several degrees of *aetherial substances*; the grossest of which differs, as much, in *specifick gravity* from the *air*, as the *air* differs from *water*; these several degrees have also *separation*, and *difference*, amongst one another; but so that, upon the least

least occasion, these separations may open, and let in some of the grosser of the *etherial substance* upon the place, or space, wherein the purer resides ; and again, at pleasure, force it out ; this is analogous to what would happen to a bladder, forceably, detained under water, if suppos'd to suffer, in the air by which it is blown up ; a *Sustole*, and *diastole*, each of which motions, must, of necessity, force the bladder to move ; or, as it were, give it a force, or endeavour, to emerge, and rise to its proper element : and because in the *Soul*, or *Spirit*, of animals, there is an entire Communion, or rather union, of the whole, it being, in any part, affected either by the motion of the air which causes *vision*, or by the motion of the air which operates on its auditory organs ; or by the quality of the effuvia, of neighbouring bodies, which strike upon the olfactory organs ; or by the disposition of the particles of matter that it receives into its body,

body, or vehicle ; or by the meeting with, or striking, its vehicle against any other body ; all these several motions, as they happen to any part of the vehicle, must affect the Soul by forcing some of the grosser particles of ætherial matter in upon the purer ; and this motion, directed either to avoid, or pursue, the object or first motion, that is the cause of sensation, to the soul.

APPENDIX.

THE Author has, insensibly, led himself to the consideration of the rational soul of man ; but seeing that is a subject requires, no small, leisure ; he is willing to receive the judgment, of others, how far he may proceed upon the principles, already, laid down ; before he dare go about so dangerous an undertaking.



A P H Y P H A

bol gldfildif and veliky THE
cbl lo mofl blym et do nifmif
ai udi mif and ;mif to ino hafmif
cif
fes fomym cib atcote of gaillor si
niqu pccozq vsm fd rsi woi andto
ad ;hafibis ybysis ,isgipmifeda
na mifgab of mods eg ar haf mofl

3 L V

>

